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QUEENSLAND AGRICULTURAL JOURNAL

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PART 1.

Event and Comment.

A Thought for the New Year.

MR. WALKER, in his New Year message to farmers, has given us an inspiring thought. "We owe something more to Australia," he says, "than merely weighing the harvest and taking tally of the yearly yield. We owe her good and continuous service in every department of life." Service, after all, is the glory of life, its only real glory. So let us teach service to Australia, preach it everywhere, and practice it ourselves. National life cannot be expressed in pleasant little platitudes. National life is something more than just an academic phrase, something more than a happy abstraction, a theme only for after-dinner speeches. National life is real and significant, and every day it becomes more varied and complex and, if we may say so, more scientific. Our idea of individual responsibility requires, possibly, even stronger reinforcement.

When all sections of the community become sufficiently interested—the hard economic facts facing us to-day are compelling that interest—and come together in one capacity or another for consultation and decision, then shall the nation be really organised—an organisation that will mean better control and direction of industry, the avoidance of all waste in our enterprises, and a spirit of reciprocal trust and co-ordination of effort diffused among all classes.

A new year has begun. Fresh opportunities are opening before us. Now and not to-morrow is the time to prepare to accept them.

Tobacco Fertilisers.

YEARs ago all our tobacco was grown on rich soils requiring no fertilisers, but now poorer soils of suitable mechanical condition, and which unquestionably require the help of artificial fertilisers, are selected. Whilst it is an easy matter to recommend a formula for fertiliser applications to increase the weight of the crop, we will require extended practical experience in Queensland to ascertain how such an application will affect the smoking quality of the tobacco, on which the value of the crop chiefly depends. In August of this year a conference of agricultural workers representatives of fertiliser industries, and officers interested in tobacco culture in the United States of America, was held at Oxford N.C. to agree on recommendations with regard to the use of artificial fertilisers for tobacco culture on all average American soils, and was reported in the September number of the "American Fertiliser."

For the growth of bright flue-cured tobacco on heavy or more productive soils, 800 lb. to 1,200 lb. per acre of 3-8-5 mixture was recommended. On the light or less productive soils 4-8-6 mixture was preferred. In these fertiliser mixtures the nitrogen to be supplied is at least $\frac{1}{4}$ by nitrate of soda, $\frac{1}{4}$ by high-grade organic material like cotton seed meal, fish, or meat meal, the remaining $\frac{1}{4}$ by urea or other inorganic sources. Phosphoric acid must be in form of high-grade superphosphate. Potash is used in the form of high-grade sulphate which should not contain more than 2 per cent. of chlorides. In many cases the addition of magnesia may be a great advantage, and the mixed fertiliser should supply 2 per cent. of magnesia. Part of the fertiliser can, with advantage, be supplied as top dressing about three weeks after planting.

For dark tobacco (sun-cured and shipping) the recommendations are to use 600 lb. to 1,000 lb. of the 3-8-3 mixture mixed in the drill, and part of it ten days after planting. For plant beds the chloride contents should not be more than 1 per cent., and a mixture 5-8-3 with 1 per cent. of magnesia is recommended. Until we have carried out fertiliser experiments of our own, we have to follow the American recommendations and use the mixed fertilisers.

Banana Marketing.

THE Minister for Agriculture and Stock (Hon. H. F. Walker, M.L.A.) remarked recently that his attention had again been drawn by the Minister for Agriculture in New South Wales (Hon. W. F. Dunn, M.L.A.) to the laxity displayed by some Queensland banana-growers in the grading of fruit intended for the New South Wales market. Mr. Dunn pointed out that it was unfortunate that growers were not acting up to the Regulations gazetted at their own request, and in addition to not grading the fruit allowed under the Regulations, in conformity with the various grades, they were sending much fruit which did not comply with any grade. Whilst up to date no legal proceedings had been taken against any of the defaulting growers, it must be realised that in the interests of the industry something must be done to place the marketing of bananas on a satisfactory footing. The New South Wales Department of Agriculture, Mr. Walker continued, was sending the names of the growers who did not grade according to the Regulations to the Queensland Department, and the agents of the Banana Industry Board in the districts concerned were being instructed to strictly enforce the Regulations in instances where fruit was not graded and cases branded as required.

The Banana Industry Protection Board.

MR. WALKER stated recently that since the appointment of the Banana Industry Protection Board that body had given attention to various phases of the banana industry, but it was not until August of this year that agents and other members of the staff were appointed, consequently efforts before then were more or less circumscribed. Attention has been devoted mainly to the eradication of neglected and abandoned plantations, and as a result some 2,220 acres had been completely eradicated prior to the 31st November. A further fairly large acreage is in process of eradication.

Prior to the advent of the planting season, a planting policy was decided upon and published. This policy appears to have given general satisfaction. Owing to some changes in the allocation of agents where the appointments had been made from the staff previously working under the Diseases in Plants Act, and two of the other appointees declining to accept their positions, a little unavoidable delay was occasioned, but not sufficient to have any material influence on matters incidental to

planting. This has been fairly heavy, 1,500 permits having been issued before the end of November. With the termination of the planting season it is proposed to give closer attention to the eradication of diseased and abandoned plantations, it being fully recognised that best results cannot be obtained from other places while these are allowed to remain to breed and disseminate disease. The close scrutiny which has been maintained over the northern boundary of infestation of Bunchy Top will be continued. Odd instances of reappearance of the disease have been recorded during the past season, but on the whole the position in this respect may be regarded as satisfactory, though further south the necessity for closer attention still exists. In the South Coast district large areas have been eradicated, and planting has been extensive. With few exceptions, which include some of the Bay islands, the position is reasonably satisfactory. In the Coomera district exception is taken to the indifference displayed by certain growers, one of whom has been twice prosecuted and fined. Further orders have been issued on these defaulters.

Dairying in Queensland.

NEARLY every dairying district had a prosperous year. The output of butter for Queensland exceeded that of the previous peak year, 1928-29, by over one and a-half million pounds. Cheese production, however, fell short of that of the same year. The total quantity of butter manufactured during the term was 75,999,058 lb., and of cheese, 12,374,705 lb. In addition, 1,999,659 lb. of condensed milk was made; a large quantity of coffee and milk and "Bettabread" was also produced from milk supplied to the condensary. Production was fairly regular from month to month. As a result of a succession of good years, the industry is expanding rapidly. In the Central and Northern Divisions development has been remarkable. Herd improvement is extending in practice among dairy farmers to the general benefit of the industry. The replacement of more or less depreciated plants with large modern factories was a notable feature of the year's progress. Butter and cheese factories now in operation number respectively 51 and 64. A condensed milk factory is also working.

The amount of capital now invested in the industry in this State is estimated at £37,000,000. The value of the output for the year just ended was approximately £7,500,000.

An analysis of grading results shows a considerable improvement in quality of dairy products. The condition, body, and texture of the butter examined was generally excellent, due to modernised factory equipment. The output of a few factories, however, was below the generally high standard of Queensland butter. The quantity of second-grade butter is still too great, and corrective measures are being adopted. Improvements in factory practice were observed, and much educational effort was directed towards ensuring the delivery of first-quality cream.

Second-grade cream is still coming forward in too great a volume, though this fact may be attributed in part to the bountiful growth of herbage on our pastures that give strong flavours to the product. This condition is largely corrected, however, in the process of pasteurisation and deodorisation at the factory; but it is obvious that greater efficiency in the production and handling of cream is required on those farms supplying the lower grades. Through its instructional services the Department is aiming to reduce the output of inferior cream to a minimum.

Cheese manufacture is confined chiefly to the Darling Downs, and, though last year's production was less, Queensland is still the largest exporter in the Commonwealth. There was a noticeable improvement in quality, but there is room for still greater improvement, and this would follow if all the milk delivered were up to the standard of that supplied by the careful methodical producer.

It is pleasing to report that the efforts of the Department to extend a system of purebred herd recording have met with the approval of studmasters generally, and increased activity in this important direction has resulted.

Better packing of butter has followed the recommendations of a Special Committee appointed to inquire into the causes of so-called "wood taint." As a result of experiments undertaken by this committee of investigation, it is possible that an important discovery will be revealed in regard to surface deterioration of boxed butter. Until recent years Queensland butter was packed in a neat, well-made, uniform cube box, but, with advancing prices for timber, much cheaper containers have come into use. This change in "get-up" is of doubtful value, and a medley of butter boxes is no advertisement for either the timber or butter industries. It is suggested that there would be wisdom in a further consideration of this seemingly small but actually important point in our butter marketing.

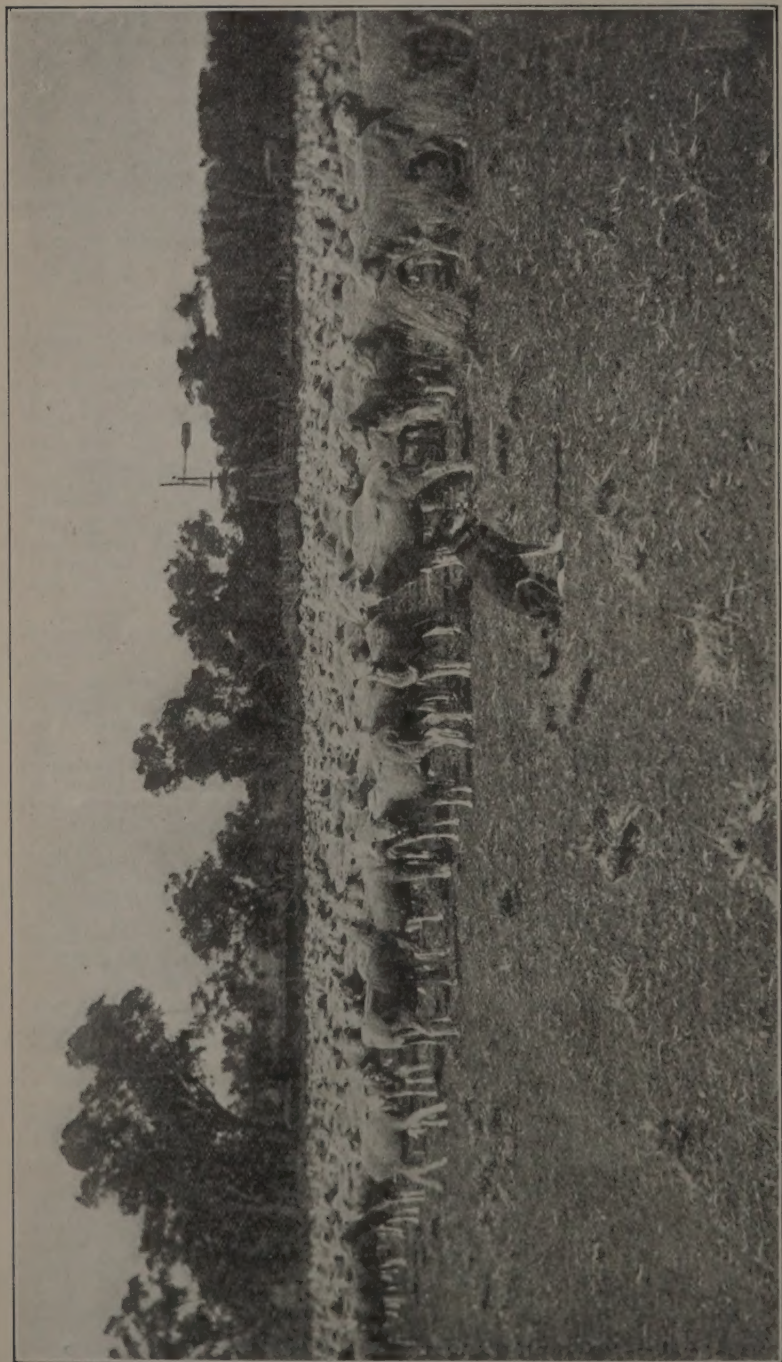


PLATE 1.—ON GUARD. THE SHEPHERD WATCHES HIS FLOCK.
A scene on a Western Queensland sheep run.

The Minister's New Year Message.

TO THE FARMERS OF QUEENSLAND.

Department of Agriculture and Stock,
Brisbane, 31st December, 1930.



Out of the experiences of the past year has come a more general realisation of the fact that primary production is the life blood of Australia's economic existence. In this time of difficulty, to the land we turn naturally as the source of our national stability. The farmers of Queensland have responded nobly to the call for increased production which is the real material wealth of the country. Prosperity for commerce and community services can only come from the primary industries.

We all owe something more, however, to Australia than merely weighing the harvest and taking tally of the yearly yield. We owe her good and continuous service in every department of life. "Faith without good works is dead."

In all our undertakings good team work is essential; anything less at this juncture would constitute a challenge to our common sense and to the real Australian spirit—the spirit that manifested itself so magnificently in 1914 and in the fateful years that followed.

Confidence and courage are the keynotes of our national character, and in all those things by which a nation is built Queensland farmers have not been found wanting.

In the coming year, I trust that happiness will remain in your homes, that you meet with the success you deserve in all your enterprises, and share abundantly in the return to greater prosperity which we know must come.

Harry F. Walker

Bureau of Sugar Experiment Stations.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report of research work in connection with the life-cycle stages and economy of our little known species of Scoliidæ named Scolia formosa Guer., September to October, 1930, from the Entomologist at Meringa, Mr. E. Jarvis.

DIGGER-WASP PARASITES.

TO most people the word wasp suggests something painful in the way of a sting, this being only natural when the insect chances to belong to the Vesipidæ, a family which includes such pests as the well-known hornets, several species of which attach their paper-like nests of cells to the under surfaces of cane leaves. Most growers have been attacked by these wasps at some time or other, and been forced to entertain a certain amount of respect for them.

We who live in the tropics are well acquainted also with another tribe of hymenoptera, known commonly as "Mason wasps," many of which build their mud nests within our houses, in corners of rooms or ceilings, or in keyholes, &c. Such obtrusive familiarity, however, may, I think, be excused on the ground that members of the family Sphegide to which these latter insects belong, although arrayed in warning colours of red, yellow, and black, and well able to sting, are not in the least aggressive or resentful if interfered with.

In the present article we shall consider a decidedly useful insect, belonging to a smaller assemblage of stinging species known as "digger wasps," which being parasitic on root-eating scarabæid grubs, such as those of our various cane-beetles, should be regarded as friends of the canegrower.

A LITTLE KNOWN QUEENSLAND DIGGER-WASP. (W)

Scolia formosa Guer., which is closely related to our well-known digger-wasps *Campsomeris tasmaniensis* Sauss. and *C. radula* Fabr., was first bred by the present writer in 1920 from a specimen captured at Gordonvale, which lived eight weeks in confinement, and deposited twenty-four eggs on grubs of the greyback cockchafer. (See Bulletin No. 17, p. 76.)

Description of Female Wasp (Fig. 1).

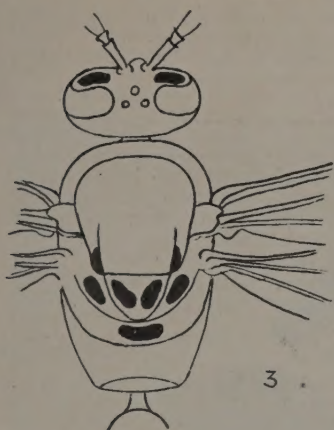
This handsome insect, measuring 22-24 mm. in length (about 1½ inches), is black, clothed more or less densely on head, pronotum, and legs with dark-reddish hairs. The abdomen is barred transversely with five rather broad bands of chrome yellow, while the wings are pale smoky yellow, clouded on costal portion near apex with dark grey. Wing expanse about 43 mm.

Description of Male Wasp (Fig. 2).

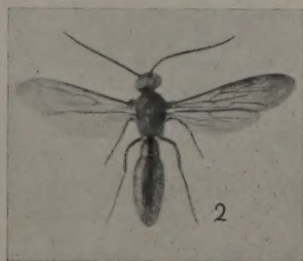
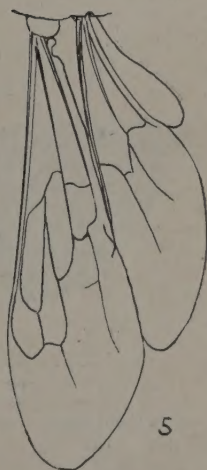
Of the usual slender form, 17 to 19 mm. long. (about ¾ inches) black, with three light-yellow abdominal bands, interrupted centro-dorsally. Legs and body sparingly clothed with reddish hairs. Labrum, prothoracic collar, coxæ, and under surfaces of femora light yellow; the labrum with a large angular black central patch. The slightly raised shining yellow blotches (which in male scoliid wasps afford good specific distinctions) are small, somewhat obscure, and arranged in positions shown in Fig. 3) large and whitish. Wings expanding about 33 mm., pale ochraceous, clouded on apex with dusky grey.

Habits of the Female Digger-Wasp.

Unlike the hornets and mud-wasps alluded to above, these grub parasites avoid the haunts of man, being, in fact, seldom seen unless searched for amongst the honey-bearing blossoms of certain herbaceous plants. During sunny days the female wasps



4



E. Jarvis, Del. and Photo.]

PLATE 2.

Fig. 1—*Scolia formosa* Guer. female, natural size.Fig. 2—*Scolia formosa* Guer. male, natural size.Fig. 3—Diagrammatic sketch of head and thorax of male wasp of *formosa*, showing position of yellow blotches—2 on front of head and 7 on thorax, figured in solid black.Fig. 4—Grub of cane-beetle, *Lepidiota frenchi* Blkb., being sucked dry by a maggot of *Scolia formosa* Guer.Fig. 5—Arrangement of nervures on wings of female wasp of *Scolia formosa*; $\times 4\frac{1}{2}$.Fig. 6—Male and female wasps of *formosa* at rest on flowers with wings closed.



E. Jarvis, Photo.].

PLATE 3.—*SIDA CORDIFOLIA*.

A honey-bearing plant which is much favoured by Digger-wasp Parasites of the genus *Campsomeris*. *Inset*—Seeds of same, natural size.

usually feed between the hours of 10 to 11.30 a.m., the afternoon being probably passed in searching for suitable larvæ upon which to oviposit. To locate the exact position of a grub when it happens to be lying at a depth of 4 to 6 inches or more in firm uncultivated forest land overgrown with vegetation, would seem to us a well-nigh impossible task; and yet this female parasite, whilst flying along through the scented bush, is able, by the aid of some marvellous sense which we do not possess, to immediately detect the presence of its underground host. Suddenly pausing in her flight and dropping to the ground, she feverishly commences to burrow downwards into the soil. Upon reaching the grub it is soon stung into the desired state of paralysis, after which the wasp coolly attaches an egg to the body of the victim; the maggot ultimately hatched from the same being destined to flourish and grow fat upon the living juices of its helpless host (Fig. 4). Before all this can happen, however, a fierce combat has first to be fought out in subterranean darkness, while the wasp's intelligence is being matched against the greater strength and more powerful jaws of its opponent.

Details of the Life Cycle of *Scolia formosa* Guer.

The winter brood of this digger-wasp, which will now be described, is interesting from a biological standpoint, since meteorological conditions during the course of our cooler months exercise no little influence on the duration of the metamorphosis of scoliid wasps. The time required for completion of the combined egg and larval stages of this insect was found to be twenty to twenty-four days, while its entire life-cycle (from egg to adult wasp) under an average shade temperature of 68 degrees Fahr. occupied about 105 days. Comparing these results with data obtained in 1917, and summarised later in the "Queensland Agricultural Journal" (vol. xviii., pp. 42-43) respecting the summer brood of *Campsomeris tasmaniensis* Sauss., which is a digger-wasp of about the size of *Scolia formosa* Guer., it appears that a fall of 18 degrees Fahr. in average shade temperature is sufficient to cause a difference of about three months between the duration of winter and summer broods of species of Scoliidæ.

The insect in question, which has just been bred successfully at Meringa, was caught on 23rd May, and lived sixty days in confinement, depositing a total of thirty-five eggs upon grubs of our greyback cockchafer. The breeding period, however (from laying of first egg to emergence of last wasp), lasted 137 days (27th May to 11th October), resulting in the production of fourteen cocoons, nine of which produced wasps, six being of the male and three of the female sex. The average number of days passed in the egg, larval, and cocoon conditions were seven, sixteen, and eighty-three respectively, while the complete life-cycle occupied from 101 to 114 days. These results were satisfactory, as up to the present the male of *S. formosa* has never, to my knowledge, been captured here on the wing, and was not represented in our official collection of insects.

Host Grubs of *Scolia formosa* Guer.

While studying the economy of this species, larvæ of different cane beetles were confined in a breeding-cage with one of the female *formosa* just bred here, in order that host relationships might be determined. Although refusing to take notice of larvæ of *Dasygnathus australis-dejeani* Mael. or *Cocachroa decorticata* Mael., oviposition occurred readily on grubs of *Lepidiota caudata* Blkb. and *L. consobrina* Gira., but reluctantly on those of *L. frenchi* Blkb. and *Anoma'a australasiæ* Blkb. The principal hosts of *S. formosa* will, I think, be found to be the greyback and glossy scrub cockchafters, which happen to be species of primary importance as insect pests of sugar-cane.

Flowers Which Attract Digger-Wasps.

Each canegrower can do a little towards the better establishment of scoliid grub parasites in the immediate vicinity of his own canefield. Species of honey-bearing flowers known to attract these useful wasps should be encouraged to grow close to headlands, or when altogether absent the seed be sown here and there on open spots adjoining the fences. In the event of grubs being present under the cane near at hand the chances are that these parasites after having taken their fill of honey and flown off over the field would start ovipositing on host grubs so conveniently situated. The following flowers suitable for such purpose occur more or less commonly around Cairns and Babinda:—(1) *Sida cordifolia* (see plate), (2) *S. acuta*, (3) *S. retusa*, (4) *Croth'aria* sp., (5) *Passiflora alba*, &c.

ENTOMOLOGICAL HINTS TO CANEGROWERS.

By EDMUND JARVIS.

Farmers requiring additional information on any of the subjects mentioned below—particularly with regard to methods of controlling insect pests of cane—are invited to consult the Entomologist, either by 'phone (25 Gordonv'ce), or by letter addressed Meringa Private Bag, Cairns. Co-ordinated action taken at the right time will often go far towards minimising injuries caused by our more serious cane pests, and whilst not unduly trespassing upon daily activities of the grower would tend to benefit him financially.

EFFICIENT CONTROL OF THE WEEVIL BORER.

It is gratifying to be able to report that injuries to cane sticks from attacks of this beetle have now been reduced to a minimum owing to the good work of the tachinid fly parasite (*Ceromasia sphenophori* Vill.). About the beginning of this year (1930) growers ceased to apply for consignments, so that the work of rearing specimens for liberation amongst borer-infested cane was discontinued for a time. During the last couple of months, however, a few requests have come to hand from certain localities where little or no attempt has been made to establish these useful fly parasites, and we have, accordingly, decided to again take up the work of breeding additional specimens to meet such requirements. Many farmers have not yet fully realised the value of biological control work, for on selections where this insect succeeded in gaining a footing in the past it too often happened that no provision was made by the owner for its future breeding. Indiscriminate burning of all the cane during the cutting season operates either as a severe check on the multiplication of tachinid flies, or by exterminating them altogether, and necessitates the work of liberating additional consignments being done all over again. In the meantime, before specimens of this insect become available for distribution, those troubled by beetle-borer cannot do better than to trap as many of the adult weevils as possible (see "Queensland Agricultural Journal," vol. xxxi., page 202).

ENLISTING THE HELP OF USEFUL INSECTS.

Among those insects which we recognise as being friends of the canegrower none, perhaps, are more serviceable or interesting than our common species of digger-wasps, whose maggots are nourished by the life-juices of various root-eating grubs.

Our two best known species of these so-called flower-wasps are *Campsomeris tasmaniensis* Sauss. and *C. radula* Fabr., the females of which are large hairy wasps about 1½ inches in length, and ornamented with conspicuous bands of orange-yellow and black. Their white maggot-shaped inactive larvæ, about an inch long, are often found in plough furrows attached to dead or dying cane-grubs. These spin cocoons of a dark reddish-brown colour, composed of silk hardened to the consistency of stiff paper, from which ultimately emerges the adult digger-wasp. A third, but less plentiful species named *Scolia formosa* Guer., has just been described by the writer as being parasitic on grubs of the greyback, and those of two additional cane-beetles of primary importance.

FLOWERS WHICH ATTRACT DIGGER-WASPS.

Our farmers should do their best to encourage these useful parasites to take up their quarters on land adjoining canefields which chance to be very subject to grub attack. This can only be done by preserving or growing purposely on such areas those honey-bearing flowers which are known to be the food-plants of such wasps. The common weeds *Sida cordifolia* and *S. acuta* happen to be great favourites in this respect, while amongst other attractive flowers may be mentioned *Passiflora alba*, *Sida rectusa*, *Antigonon* sp., &c.

On cane farms where such flowers are entirely absent it would be a good plan to sow one or more favourite species on small patches of open ground here and there around the plantation, close to or immediately adjoining the headlands.

Growers desiring suitable seed can obtain same free of cost by applying to the Entomologist at Meringa.

THE SUGAR INDUSTRY.
COMMONWEALTH COMMITTEE OF INQUIRY.
MR. EASTERBY'S EVIDENCE.

The following statement by the Director of Sugar Experiment Stations, Mr. H. T. Easterby, was submitted as evidence before the Commonwealth Committee of Inquiry into the Sugar Industry, in the course of its recent sittings in Brisbane.

CONSIDERING the immense importance of the sugar industry to Australia as a whole, in even one direction—that of developing and settling Northern Australia, apart from its economic value to the Commonwealth—it is extremely difficult to understand the hostile attitude adopted by many people in the Southern States. The idea present in many of their minds appears to be that sugar-growing is a highly pampered industry in which "sugar barons, large planters, and wealthy sugar interests" derive enormous profits. As a matter of hard fact, sugar-growing in Queensland is carried on by between 7,000 and 8,000 small farmers, quite a large proportion of whom have a hard struggle to get on. The average acreage of cane in Queensland is 40, while in the more southern part of Queensland it varies from 8 to 29 acres. For many years past the cane farmer has had to struggle against the high costs of production, insect pests, diseases, cyclones, frosts, floods, droughts, and enhanced prices for all the goods he uses. During the war period the industry supplied sugar at very much lower prices than were being obtained in other countries where the huge price charged for sugar enabled the industry to build up large reserves to meet bad times later on. When an application was made on behalf of Queensland, in 1914, to the Interstate Commission for consideration, it was postponed on the grounds that the war was sufficient protection in itself, and they further stated that "the sugar-growers would have the market of Australia entirely to themselves for the next two years." This was poor consolation to the sugar-growers at a time when sugar values in all parts of world, except Australia, were increasing rapidly. No benefit, therefore, came to the Australian sugar producer, either from the effects of the war on the European crops of beet sugar or from the fact that he did have the Australian market all to himself. Better prices ruled shortly after, because the Commonwealth Government recognised that the industry was not being treated fairly, but they were in many instances counteracted by industrial difficulties in the Southern States which held up supplies of bags and lime, and the conveyance of raw sugar to the refineries, and in Queensland itself, with serious trouble in the transport services, both on land and sea.

War Time Sacrifices.

Australian consumers and manufacturers profited at the expense of the industry for many years in obtaining cheap sugar while the rest of the world was paying enormous prices—up to 1s. 6d. per lb. It was always anticipated that owing to this fact, and that the sugar-grower never asked for world's parity during the war, that he would be allowed fair treatment from the Commonwealth when the price of sugar was being considered.

The Industry of Vital Economic Importance.

From the standpoint of economics, the Queensland sugar industry is of vital importance to Australia, especially in the difficult times that are now ahead of the nation. Supposing there were no Australian sugar industry, we would have to face a bill for millions of pounds to purchase sugar overseas, and to pay the high rate of exchange now charged, to say nothing of the employment now provided by, and the value of the machinery, buildings, and land used in the industry.

It has been shown over and over again that of all the commodities in common use sugar has increased in price the least of all. As the sugar industry has been influenced by the same laws which govern the higher costs of all other foodstuffs, it is extremely difficult to understand why the foodstuff sugar is invariably selected for attack. Butter, which in 1929 showed an increase of 91.2 per cent. over the price in 1914, is never challenged, though in its manufacture nothing like the same amount of labour is employed, nor does it serve the purpose of peopling the empty spaces of the North.

The White Australia Doctrine.

The only industry that can profitably be carried on along the northern coast of Queensland is that of sugar; this has been proved over and over again. When the White Australia policy was adopted, the Commonwealth Parliament decided that the labour employed must be white, and that meant wages, hours, and conditions must be up to the standard. In 1900 practically all the sugar-cane was grown by coloured labour. The Federal Government recognised at the time that it must make the sugar industry sufficiently profitable to render it possible for growers to engage white labour on their farms, though it was felt that it was a huge experiment, for up to that time no country in the world had ever attempted to grow cane by white labour. To do this the Commonwealth introduced the Excise Tariff Act at first, and an excise of £3 per ton on manufactured sugar was imposed with a rebate of £2 per ton on all sugar-cane delivered on which white labour only had been employed. In order to quicken up the substitution of white for coloured labour this was subsequently altered to a so-called "bounty" when £4 a ton excise was charged, of which £3 a ton was returned to white growers, and this lasted up till 1913, when it was abolished, white labour by that time growing practically all the cane.

Repeal of Federal "Bounty."

The Act for its repeal provided that the "bounty" should be abolished on condition that the Queensland Parliament introduced satisfactory legislation to safeguard the industry and provided for the employment of white labour. Accordingly legislation was passed by the Queensland Government (on the understanding that the excise on sugar would be abolished with the bounty), which provided that the miller should pay the whole of the amount he had been paying as excise to the Commonwealth Government to the grower. This meant that, in addition to the old rates of bounty, the white cane-grower would receive 2s. a ton of cane which had previously been received by the Commonwealth Government, this being the sum equivalent to the £1 excise retained. Another Act was passed making temporary provision with respect to the rates of wages and conditions of employment in the sugar industry until such matters were dealt with by awards of the Industrial Court. The rates of wages then laid down and the conditions were those specified in the Commonwealth Act of 1912. A third Act was for the purpose of prohibiting certain types of labour in the field, and its object was to shut out coloured labour or aliens, as might be required. This was not to apply to nations such as Italy, Russia, and others where treaties existed.

The Commonwealth Government being satisfied with this legislation issued a proclamation in July, 1913, abolishing the Sugar Bounty and Excise Act. The conditions as to price lasted until the constitution of the Cane Prices Board in 1915, which then fixed the prices to be paid for cane on its sugar contents.

The so-called "bounty," in any event, was only a rebate out of excise collected, so that the Sugar Bounty Act passed by the Commonwealth Government as part of the White Australia policy did not cost the people a penny; indeed, it was estimated it put £2,000,000 into the Commonwealth Treasury.

Settlement and Defence of Tropical Regions.

The Federal Royal Commission on the sugar industry, which sat in 1912, said, among other wise things, that "if the ideal of a 'White Australia' is to become an enduring actuality, some means must be discovered of establishing industries within the tropical regions, and that the ultimate—and in our opinion the effective—justification of the protection of the sugar industry lies beyond questions of industry or wealth protection—it must be sought in the very existence of Australia as a nation. So long as these regions are unoccupied they are an invitation to invasion, as well as a source of strategic weakness. While the wide divergencies of opinion which exist to-day with respect to the relation of public control to the sugar industry are often the result of mere ignorance of essential data, they are still more frequently the result of the failure to outgrow ideas, opinions, or policies which belong to the limited outlook of pre-Federal days. The problem of the sugar industry to-day is not, save in subordinate respects, a problem of industry, of wealth, or of production: it is primarily and essentially a problem of settlement and defence."

These remarks are as vitally applicable to-day as they were when they were written. This statement received ample support during the war, when the enlistment of men from the sugar districts was said to be the highest in Australia—viz., one in eight of the population of North Queensland.

A Small Farmer's Industry.

The sugar industry in Queensland as it is carried on to-day is essentially a small farmers' industry, and this is of the greatest advantage in settling a virile, energetic race in the tropical part of Australia as free men with a personal interest in their own lands. These farmers are the hardest workers we have. I, personally, think it will be found that the cane farmers, taken as a class, are no more prosperous than any other class of agriculturist, certainly not nearly so prosperous as many Victorian wheat farmers. Many of them are indebted to storekeepers, banks, and mills for financial aid. I have had thirty-two years' experience in the sugar industry, and during that time have been moving through the sugar districts and meeting cane farmers. My experience leads me to say emphatically that the majority of sugar-cane farmers are hard working men of small resources doing their best to improve their farms, and those of them that had to clear dense jungle and carve out a home for themselves and families in the tropical heat of North Queensland are deserving of the highest consideration and respect. It has been no small matter to leave the sheltered conditions of established communities and take up the work of making a cane farm, and by doing so adding to the wealth of Australia. Nor must the part played by the wives of these settlers be overlooked. It has been said "The white woman is rendering her tribute in populating and settling the North which commands the greatest praise." A woman who has to cook in a kitchen where the summer temperature is often over 100 degrees, under corrugated iron, demands the utmost sympathy, and many of our women of the North are called on to do this and even to bear harder burdens in the making of a home. A trip away from these conditions to the cooler South is essential at least every two years.

The Value of the Industry to Australia.

As giving some indication of the value of the industry to Australia, the following may be cited:—

The sugar industry employs over 20,000 men in the fields, mills, and refineries. Directly and indirectly it gives employment to 100,000 persons. Trains and steamers are employed in carrying thousands of tons of raw sugar to the Southern refineries and bringing back freight such as farm implements, mill supplies, jam, clothing, boots, &c., to supply the numerous sugar producers and wage-earners, as well as the population of the coastal towns in Queensland dependent on the industry. The Queensland sugar-mills also provide a good deal of work for the foundries of the Southern cities, and provide work and capital at the refineries in Sydney, Melbourne, Adelaide, and Perth. The sugar industry combines agriculture and manufacture, and as such affords a large market for goods of Australian manufacture.

The wages paid for labour in the Queensland sugar industry amount to £6,000,000, and no agricultural industry in Australia employs so much manual labour. This distribution of wealth, but for the Australian industry, would go to foreign countries which take little or nothing from us in the way of exports.

The industry has increased the population in the Herbert electorate (which stretches from Mackay to Thursday Island) by over 40 per cent. in recent years. Large towns and cities, such as Cairns, Innisfail, Ingham, Ayr, Mackay, and Bundaberg, are almost entirely supported by the industry, while other townships are absolutely dependent upon it. The capital invested is considered to be in the region of £30,000,000.

Many fine townships in Queensland are due entirely to the sugar industry. Take the case of the erection of the Tully mill alone. A few years ago where the township now stands there was nothing but impenetrable jungle. With the building of the mill the whole face of the country was changed, and a town with all the adjuncts of civilisation, such as churches, hospital, cinemas, post office, telephones, and schools, has now taken the place of dense jungle. Babinda and South Johnstone townships were built in similar circumstances and surroundings.

A White Man's Industry.

The sugar industry enables Australians to live as white men in the tropical regions, and it is now known that medical men consider a healthy and vigorous stock can be raised in North Queensland. Take away the sugar industry and what will happen to all that has been accomplished in settling this country and building cities? Its wealth of small farms will revert to jungle, and the probable incursion of other races, because we would not be effectively making use of this great territory. The responsibility is with Australia. As the Federal Royal Commission pointed out: "A white community which prefers to grow its own sugar in its own territory with white

labour must face the responsibility of making good the increased cost of production under the higher standard of living and reward. Either the consumer or the taxpayer must pay." Sir Henry Jones, head of the great jam-making firm, in 1921, said: "We are not up against the Australian sugar industry. We know quite well that we must pay a price that will enable the sugar to be grown by white labour, and we are quite willing to do this. In so far as the Australian market is concerned, it does not matter to us what price we pay for sugar."

It must always be borne in mind that the sugar producer is not permitted to buy his labour in the cheapest market. The Commonwealth Government ordered as a matter of national policy that only white labour should be employed, and then for many years commanded the rate of wages that had to be paid. Later this was handed over to the State Arbitration Court by the Commonwealth when it abolished the excise on sugar.

Field and Factory Efficiency.

The efficiency of the industry at the present moment cannot be considered as other than good. The milling work is excellent, and Queensland holds the record of producing 1 ton of sugar from a lesser amount of cane than any other cane-producing country of the world. The following table shows the improvement in this respect since 1900:—

Year.	Tons of Cane Required to Make One Ton of Sugar of 94 net titre.
1900	10.09
1910	8.73
1920	8.00
1929	6.91

In the field the efficiency has also increased materially, particularly in the yield of sugar per acre. In 1900 the yield of sugar per acre was only 1.28 of 88 net titre sugar, while in 1929 it was 2.41 tons per acre of 94 net titre sugar. In the Ayr district, with irrigation, the yield of sugar per acre reaches 3.68 tons. In 1900 the total yield of 88 net titre sugar was 92,554 tons. In 1929 the yield of 94 net titre sugar was 518,516 tons. The acreage from which cane is crushed has just been trebled in this period, but the total yield of sugar is now over six times as great.

Comparisons with other Countries.

No comparisons can properly be made between the sugar industries in Java, Hawaii, and Australia, as conditions are so totally different. In Java only plant crops are grown, as after one crop of sugar-cane the land has to be returned to the native owner for the cultivation of native crops, such as rice and maize. Sugar-cane is only allowed once in three years, so that a legally enforced rotation becomes imperative. It is for this reason, combined with the intensive cultivation of small areas by hand labour, that the yield per acre is so high. It also means that the area of an estate is at least three times larger than its annual plantation.

There are about 900,000 unskilled labourers, mostly in the fields; children and women earn from 4d. to 6d. per day, and men from 10d. to 1s., all on piecework. When a native considers he has earned sufficient for his wants he will very often sit down for the rest of the day. This class of labour is mainly employed between April and October; they have other means of support during the months of November to March. In addition to this large mass of unskilled labour, the sugar industry in Java employs some 56,000 regular native employees, most of whom are more or less skilled, and are paid, according to their position, from 1s. to 7s. per day, the average running from 1s. to 2s. 6d. per day.

The price paid to the natives for leases and the forbidding of growing ratoon canes compel the plantations to get the highest possible yield of cane and sugar per acre, and for this reason the cultivation has necessarily to be of the most intensive character. The intensive cultivation is made easy for the sugar planter in Java because of the abundant and cheap supply of labour; hence the tillage operation is carried out almost entirely by hand, and planters say that hand cultivation is cheaper for them than mechanical cultivation.

As far as the culture of sugar-cane is concerned, the conditions in Queensland and Java are so radically different that it would be impossible to apply Java methods of cane culture to Queensland. As a matter of fact, cane culture in Java is not "agriculture," but has been aptly described as "horticulture."

Imagine our farmers digging all the cane drills in a field and neatly piling the clods at the sides. Imagine their wives and children planting the cane and irrigating by pouring pails of water over the plants by hand from the neighbouring irrigating ditches and making holes and pouring carefully measured spoons of fertiliser against each stool. Imagine the different hillings up, and the care taken in the final hilling up, when the trash is pulled off the cane and the earth fitted closely up to and between the stools, all by hand labour. Imagine all these operations which actually take place in Java, and then ask: Would it be possible to carry them out in Queensland? Cane so grown in Java is on an immense number of small areas.

The Sugar Experiment Station in Java is acknowledged to be the finest in the world. It is the property of the General Syndicate of Sugar Manufacturers, and possesses its own governing board and its own revenue. The annual contribution of the sugar factories is at the present time equal to about 4s. 8d. per acre, the revenue amounting to more than £116,000 per annum.

The permanent staff of this Java Experiment Station at the present time consists of about 45 Europeans, 10 Chinese, and 250 natives, in addition to which there are 15 European local agents in the Extension Service of the Agricultural Branch. There are 34 houses for the European staff, and 8 of the 15 houses occupied by the Extension staff are also the property of the station.

The irrigation works in Java are of great magnitude, and the waters are rich in a silt containing potash and phosphoric acid, stated by Prinsen Geerligs to be quite sufficient for the cane crops, so that only nitrogenous manures are required.

In Hawaii, which leads the world in sugar production per acre, enormous sums are spent in irrigation and manures. The plantations and mills are all in the hands of large companies who are able to spend unlimited amounts of capital to secure results. Moreover, the tons of sugar produced are what are known as short tons, and the crops take practically eighteen months to two years to grow, as compared with twelve months' cane in Queensland, and the yields from the non-irrigated areas are not greater than in Queensland when this is taken into consideration.

Efficiency cannot be measured by comparison with other countries. Is our own industry efficient when taken in the light of its conditions and surroundings? I personally consider that it is, and by this I would not be understood to say there is no room for improvement along given lines, but this improvement is gradually being made and will come more to the front as scientific lines of teaching are followed; and our farmers are showing great aptitude in adopting such lessons.

Queensland in a Leading Position.

In the use of up-to-date farming machinery the Queensland sugar industry is in a leading position, and this is generally recognised by other cane-growing countries, who have frequently sent their representatives here to pick up knowledge on cane-farming implements, and have made many purchases of our machinery, all of which is good for the Australian manufacturer, who has at all times shown great readiness to manufacture special implements for cane cultivation, and to adopt suggestions made at different times for their improvement. It can be safely affirmed that in implements for the tillage of sugar-cane Australia leads the world.

The following extracts from reports made by two overseas visitors to the Queensland canefields are well worth quoting as showing the opinions formed by quite independent men on the Queensland sugar industry:—

Mr. L. D. Larsen, manager for the Kilanea Sugar Plantation, Hawaii, after attending the meeting of the International Society of Sugar Technologists in Java last year, spent some few weeks in a round of visits to some of our Queensland districts, including Bundaberg, Mackay, and the Burdekin, after which he wrote:—

"I have been travelling over four months now and have looked over the sugar industries of Formosa, the Philippines, Java, and Queensland. Aside from a general survey of the industry and attending the Sugar Congress in Java, I have been looking more particularly for methods and devices that may be of practical value in Hawaii for saving labour and reducing costs.

"From this latter point of view my trip through Queensland has been by far the most profitable. The other countries visited, while intensely interesting, had conditions that were less applicable to our own. The low price of labour in these countries made labour saving of minor importance, and as a consequence they were

not rich in labour-saving devices. In Queensland, where the cost of agricultural labour is higher than anywhere else in the world, employers of labour are bound to pay special attention to labour economy, and, as was to be expected, I found my richest territory in this respect here.

"Although I visited several of the mills, my attention was concentrated principally on the field, where I was rewarded by finding several interesting developments for labour economy. The most outstanding of these were as follows:—

1. The general practice of machine planting.
2. The development of new and original implements for inter-row cultivation.
3. The use of machines for applying fertilisers.
4. The development of machines for weeding in the cane-row.
5. The interest and earnest endeavours that are being made to develop harvesting machines.

"While the latter is not yet a full-fledged practical success, it has shown excellent possibilities, and I believe has every chance of being a practical success in the immediate future under conditions obtaining in Queensland.

"I do not intend going into a detailed description of these various implements and their uses at the present time; but I must stop to compliment the Queensland agriculturists on their progressiveness and originality along these lines. Two of these implements—the roto-cultivator and the spinwheel-weeder—are distinctly original types, while a third—the rake-cultivator—and the scratcher are adaptations of an old-type farm implement to a new use.

"The cane planter is also a distinctly Queensland product, and is decidedly simpler and more efficient than the planter occasionally used in Hawaii.

"In travelling over Queensland I was particularly struck by the high degree of intelligence and interest shown by the labourers themselves in the work, and in the sugar industry as a whole. I talked with many of them in the fields and in the hotels, and I always found them anxious to talk about field operations, implements, the industry as a whole, its future—and the Government.

"The farmers also seemed very intelligent as a class, and, with a few individual exceptions, practised clean and intelligent culture. The canefields as a whole were cleaner and better than one is led to believe from the average yield-average.

"Conditions in Queensland are unique in the sugar world on account of the high wages paid for field labour and the use of white labour. However, I believe the situation is being met intelligently by employers as well as employees. I did not find the tendency on the part of labour to shirk and hold back the job that is evidenced in some other highly organised labour communities. I studied men employed at task labour and at day labour, and believe their application and efficiency are decidedly superior to that of our labour in Hawaii or the other sugar countries visited. The relations between the plantation manager and his employees seemed decidedly pleasant in the cases I had opportunity to notice, and I believe the plantation managers are to be commended for the way they have met and adapted themselves to conditions of labour and to Government regulations that at best must be arduous and irritating. Impossible as these conditions seem to one accustomed to the use of coloured labour, they are taken in Queensland as part of the business, much as we in other countries look upon taxes and unfavourable weather."

A South African Visitor's Impressions.

Mr. T. W. Wickes, an engineer prominently identified with the South African sugar industry, said:—

"Amongst the most attractive sights to a visitor from abroad to witness is that to stand by watching a gang of your Australian stalwarts—viz., your cane-cutters—at work. The physique of the men whom I had the pleasure of seeing at work might well make a strapping Zulu 'boy' envious, and one realises therefrom the remarkably healthy conditions of Queensland, despite the tropical heat. Seeing these men at work also is, I should imagine, the finest argument in favour of contract or piecework, which at times is a bone of contention."

Cane Cultivation.

With respect to the use of fertilisers, the quantity applied per acre far exceeds that applied in the Southern States, as sugar-cane demands much heavier dressings.

The amount of cultivation required for cane as compared with wheat-growing, for instance, is considerably greater. In wheat-growing the land does not require much

more than shallow ploughing, which can be carried out with gang ploughs covering a wide extent of land, whereas cane land must be deeply ploughed and worked and single drills drawn for the plants. Wheat is seeded by machines several rows at a time, while cane plants have to be set out in single furrows. Fertilisers, too, can be applied to wheat in several drills at a time, but to cane only in the single drills. This naturally renders operations in the cultivation of cane much more costly than wheat or cereal growing.

Non-British Labour.

Evidence will be given by others as to the incidence of non-British cane growers and cutters. It may be remarked, however, that I found, when paying a visit to the beet sugar factory at Maffra, in Victoria, in 1927, there were 40 per cent. of Italians employed in the field, while in the Queensland industry there are under 10 per cent.

The Economic Position.

The low price of sugar overseas at the present moment is caused by over-production, assisted by a lower consumption. There is at the present time a movement on foot to deal with the problems of over-production and to restrict the output of sugar by foreign producing countries; and if this is done the price will materially advance.

British Preference.

If Great Britain, as she has done in the past, thinks it wise to preserve the sugar industry in her dominions by granting preference, surely Australia will be able to see the wisdom of maintaining its sugar industry. The sale of sugar from Australia overseas is at the present time of immense value to this country in increasing the Australian revenue paid by a creditor nation and by compensating for adverse trade balances. At a time like the present, every pound that comes into Australia for foods produced here is of the greatest importance. As far as the price of sugar in Australia is concerned, the weekly household expenditure on sugar is less than on any other leading food commodity. If the export of sugar is to be sacrificed, it will be Australia as a whole that will suffer, not alone in the loss of the revenue from sending sugar overseas, but in the further unemployment of a large number of men.

National Security.

There is another factor to be considered. Supposing an enemy's navy blocked the sea routes, our existence might depend on the production of power alcohol from sugar-cane. In the larger interests of Australia, the Southern people must take a long view of the sugar industry; they should not begrudge a few pence per week for their own maintenance and security. The people engaged in the sugar industry are a most effective garrison for the North.

I have not touched on land prices or detailed economic figures, as these will be supplied by others and do not come within my province.

SALE OF HOME HILL STATE FARM.

Attention is directed to an advertisement on another page, inviting tenders for the purchase of the State Farm at Home Hill. This farm is situated on the Inkerman Irrigation Area, Burdekin River. All improvements, including 34 acres under sugar-cane, will be offered with the farm as a going concern. The farm has an area of 206 acres of freehold land with a cane assignment of 72 acres gross, 54 acres net. Tenders close with the Secretary of Public Lands, Brisbane, at noon on Saturday, 17th January, 1931.

THE BROWN CUTWORM (*Euxoa radians* Guen.).

By G. A. CURRIE, B.Sc.

PART V.

OECOLOGICAL DISCUSSION.

IN the discussion which follows an attempt will be made to analyse some of the factors concerned in the survival from year to year, and the sporadic outbreaks of *Euxoa radians* as a severe pest.

The number of records of outbreaks in the past is small, and together with the experience of the last three seasons is only sufficient to formulate theories, the proof or refutation of which must lie in the future, after a number of years of observation and recording.

A great part of the life of *Euxoa radians* is spent in the soil. There the egg is laid in the loose surface, the caterpillar spends its life on or in the soil, the pupa lies therein, and even the adult moth with the gift of flight never leaves the soil for any protracted period.

With such an intimate connection between soil and insect it is not surprising that the soil conditions have a very great effect on the rate of development, structure, incidence, and survival of the object of this investigation.

Certain modifications in the structure of the larva have direct relation to the soil-haunting habit of life, so, although already touched on in the general description of the stages, they will be enumerated here.

The burrowing habit (and it is also true of larvæ boring in leaves or stems of plants) has caused the mouth parts to migrate cephalad. This becomes progressively more marked in *Euxoa radians* with each succeeding instar.

The measure of this forward and upward migration of the mouth parts is indicated by the epicranial index which has already been given for each instar. The first instar larva (Plate V., fig. 5), with its relatively long epicranial stem, has the mouth parts directed somewhat downward, while the sixth instar larva (Plate V., fig. 6), in which the epicranial stem has been reduced to a minimum, has the mouth parts directed forwards.

The subterranean habit requires no spinning, so the spinnerets of all stages are of a very reduced type. As a strong contrast between the downward-directed mouth parts of an aerial type of caterpillar and the forward-directed type of the subterranean species, the head of *Remigera frugalis* (Plate VI., fig. 3) is figured. This caterpillar lives amongst grasses, climbing up the stems and never entering the soil even to pupate; its epicranial stem is very long.

The spinneret of this insect, which spins a cocoon before pupation, is also in strong contrast with the reduced type of *Euxoa radians*, which pupates in an earthen cell. (Plate VII., figs. 1-4.)

The reduction of the epicranial stem in *Euxoa radians*, sixth instar, is the greatest yet noticed in any noctuid larva, although that of *Agrotis ypsilon* (Plate VI., fig. 4) is nearly as great.

There is comparatively little pigment in the skin of *Euxoa radians* larvæ, and this may be regarded from two angles:—

- (1) It may be considered to be a positive adaptation to life in the soil through the loss of pigment; and
- (2) It may be regarded as a negative adaptation to such a life through the non-development of pigment.

The choice of alternatives lies in the view taken as to the type of ancestor from which this cutworm is descended.

The striking nakedness of cutworm larvæ seems to bear some relation to their underground habits, and in the species under consideration there is a considerable decrease in the relative size of the setæ between the first instar which is not subterranean, and the last instar which is almost wholly so.

Whereas in the economy of many caterpillars which are surface dwellers, e.g., *Heliothis obsoleta*, the tachinid flies are important controls, this does not seem to be so true of *Euxoa radians*. Tachinids are usually active only during the day so that the nocturnal cutworms escape them under normal conditions. This applies, of course, to tachinids laying eggs directly on the caterpillars. When dull weather comes, or any condition which causes the cutworms to move about on the surface during the day, then the tachinid flies may take some toll of them. Heavy rain may cause the larvæ to come to the surface and so expose themselves to many dangers from parasites and predators. In the case of the North American pale western cutworm *Porosagrotis orthogonia* it has been stated¹⁷ that the number of wet days in May and June can be used in forecasting outbreaks. If more than fifteen days in May and June are wet there will be a big decrease in the following year's infestation. If less than ten wet days occur in May and June the following year will probably see a heavy attack. This reaction to rainfall is stated to be due to the fact that wet weather causes the cutworms to feed above ground on the upper parts of grasses, against their normal habit of cutworm feeding. On the upper parts of the grass are laid eggs of parasitic tachinids, which being ingested, develop into larvæ and cause the destruction of the cutworm.¹⁸ Other parasites and predators can attack them when the rain has brought them above ground, hence the correlation between wet days in May and June and the incidence of the attack in the following year.

It is clear that living in the soil as they do the larval and pupal stages of cutworms are to a great extent at the mercy of soil conditions. Some of the factors operating on them can now be considered.

Environmental Factors.

Townsend¹⁹ divides the insect environments into media, factors, and controls.

The primary media are air, water, and soil.

The factors are actual forces operating on the organism in the media, as heat, sunlight, rainfall, humidity, &c.

The controls are climatic and topographic, as latitude, altitude, seasons of years, &c.

Accepting this system of oecological analysis, the medium in the case of all immature stages of *Euxoa radians* is the soil.

The chief factors and controls which affect it in the soil are soil temperature, rainfall, atmospheric humidity, soil texture, soil moisture, vegetative cover, food supply, predators, parasites and diseases. These will be seen to be interdependent and the four fundamental ones would appear to be soil texture, soil temperature, rainfall (which controls soil moisture and vegetation to a large extent), heat, and natural enemies.

Soil Texture.

This factor is important from two points of view in connection with cutworm survival:—

- (1) Only in loose soils will the moth lay eggs and the larvæ live and develop.
- (2) Only fairly loose soils have the water holding and air holding powers which help survival of the cutworm larvæ. Heavy soils tend to become waterlogged when wet and caked when dry, and in either case are badly aerated.

These two points are concerned with soils in a state of nature, but cultivation can alter the mechanical condition of soils, so that a soil even if naturally heavy, becomes loose and well aerated with proper tillage. This extends the range of situations suitable to the survival and increase of cutworms, and at the same time renders vulnerable the crops planted thereon.

The chemistry of the soil has a direct effect on soil texture, especially in relation to colloidal substances; and on plant growth in the matter of "manurial salts" and hydrogen ion concentration. Apart from these indirect effects, soil chemistry has not been seen to have any direct effect on the development or survival of the immature stages of *Euxoa radians*.

Soil Temperature.

In the section dealing with temperature relations, the effect of temperature on the rate of development of cutworms has been fully dealt with. The effect of very high soil temperatures on the eggs has already been noted and high temperatures may have a considerable influence in the control of the other life stages.

Rainfall.

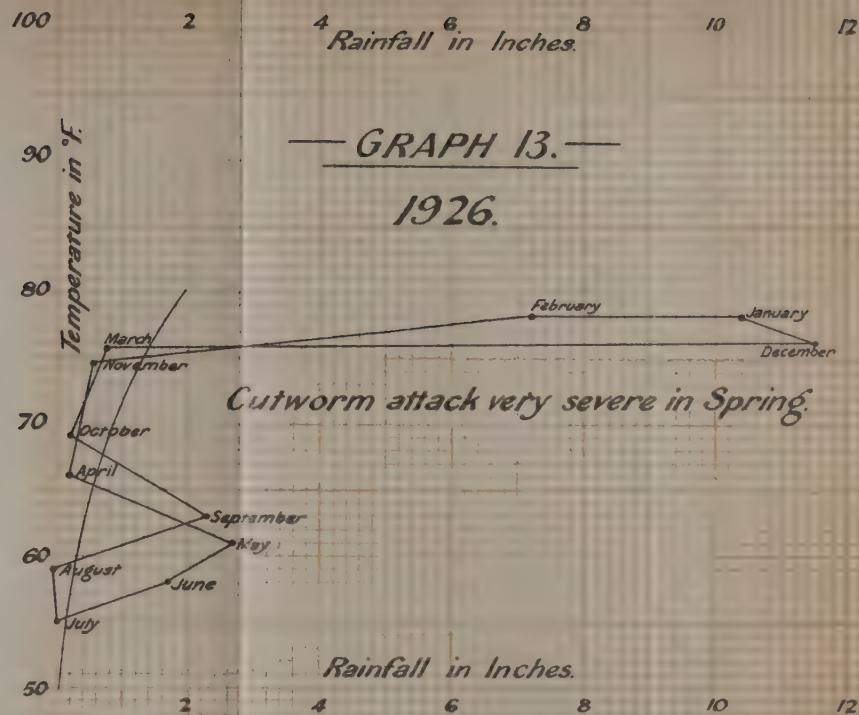
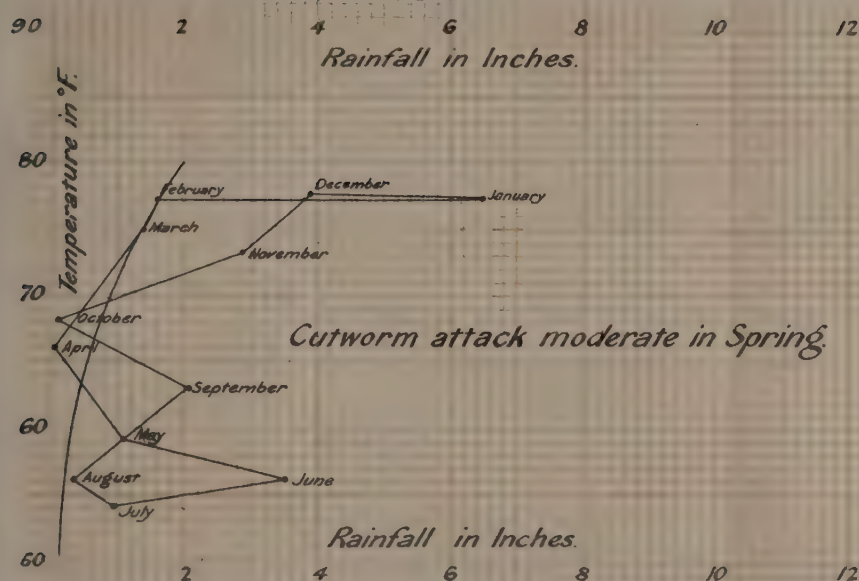
The amount and distribution of rainfall throughout the year affects the cutworms indirectly through its effect on food plants and natural enemies, and directly by flooding or soaking the soil and controlling the soil moisture at any period.

The soil moisture, at different periods of the year is a critical factor in deciding whether there will be an increase or decrease in cutworms. The effect of this factor in controlling *Porosagrotis orthogonia* indirectly through its parasites has already been noticed.

Cook²⁰ has studied the same species from the point of view of optimum soil moisture for survival and multiplication. His results are shown in a "climograph curve" which is based on soil moisture conditions obtaining at stations where cutworm damage was severe, and assumes that at different temperatures there is a soil moisture content which is the optimum for the species. The curve shows the optimum humidity at different temperatures for cutworm survival.

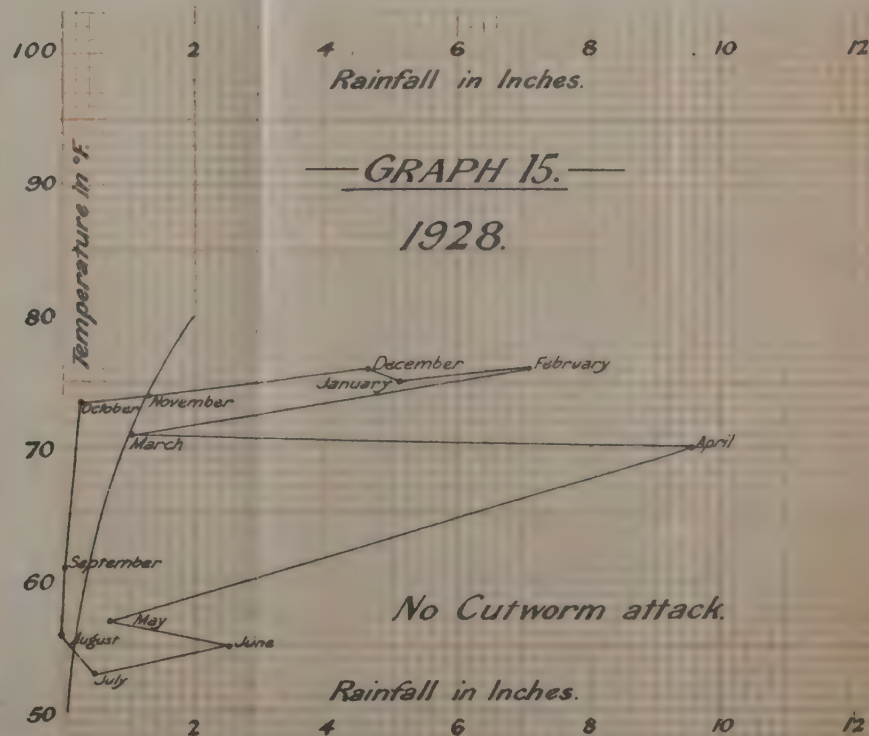
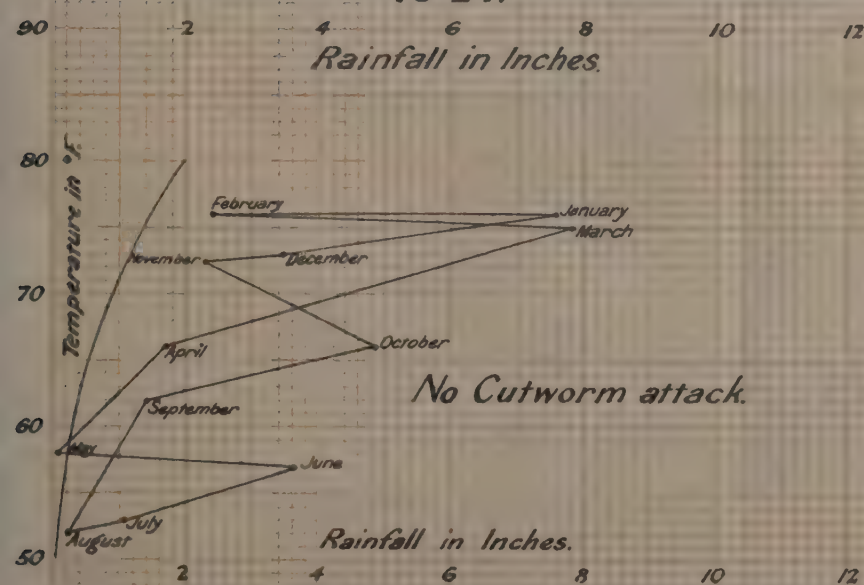
— GRAPH 12. —

1925.



— GRAPH 14. —

1927.



Climographs for Cotton Research Station, Bilccla,
in relation to damage by the cutworm *Euxoa radians* Guen.

The climograph for any place for one year is got by plotting the figures for temperature and precipitation on a graph for which these factors form the axes, and then connecting the points for successive months by a line to form a closed figure. When the shape of the climograph (closed figure) of a district approximates to the shape of the "Climograph curve," then cutworm damage should theoretically be great for that district.

Using the weather data from the Cotton Research Farm, Biloela, for the four years, 1925-1928, the climographs shown in Graphs 12, 13, 14, and 15 have been constructed.

The year 1925 had a slight attack of cutworms in October. The year 1926 saw a widespread and destructive attack in October with a less severe second attack in November, ending suddenly in December. In 1927 there was no serious outbreak of cutworms reported in the cotton areas, and the same was true for the spring of 1928.

Examining the 1926 figure and remembering that *Euxoa radians* breeds continuously throughout the year except in winter, in those districts where frosts are common, the following story for that year of serious damage by cutworms can be read:—

High temperature and heavy rainfall in January and February would probably reduce the summer brood to small numbers, and survival would be possible only in favoured situations in well drained soils, or in locations where rainfall had been less heavy.

A dry autumn in March and April would favour the breeding up of the cutworm to larger numbers, and food supply would be plentiful after the bounteous rains of summer. Accordingly a large number of larvæ would reach maturity and enter the soil to pupate in May. The cool, dry winter would favour survival of the pupæ and these would emerge in large numbers over a short period with the rising temperatures and spring rains of September.

The story from this point is well known, for a heavy emergence of cutworm moths was observed in early September. When the cotton seedlings came up in early October millions of larvæ attacked them with deadly effect. The dry weather continuing throughout October, November, and early December, favoured the survival of the pests which only succumbed finally to the drenching rains of mid-December.

In 1927 the heavy March rains prevented the autumn brood from becoming very large, and probably the cold rains in June were inimicable to the survival of the pupæ in the soil. No attack developed in the spring months and the rainfall of October carried the young cotton crop rapidly through the danger period without damage.

In the autumn of 1928 heavy and continuous rains in April suggested that few cutworms of the species under consideration would survive to pass through the winter. Accordingly it was predicted that no attack would take place in the spring. In spite of the fact that the spring months were dry and apparently favourable for an attack, none developed and cutworms were scarcer than at any time during the previous three seasons.

An arbitrary curve of optimum soil moisture conditions for the species, based on the 1926 climograph is drawn in on each of the climograph figures shown, so that a comparison can be made between that curve and climatic conditions prevailing during each year.

Where wide divergences from the general position of this curve are seen in the autumn, winter, and spring the suggestion is that soil moisture conditions were unfavourable to the survival or increase of the broods developing at that period.

Resistance to Submergence.

The danger of submergence in water for a longer or shorter period is always a present one with soil-haunting organisms. The length of time noctuid larvæ can be submerged and completely recover afterwards, has been suggested by Ripley⁸ as a measure of the degree to which they have become adapted to the subterranean habit of life.

The application of this test to *Euxoa radians*, which is especially adapted to well-drained localities and fairly arid conditions, is of doubtful value. The following notes have, however, been made:—

- (1) After twenty-four hours submergence larvæ twitched head and legs, but did not recover.
- (2) After twenty hours submergence larvæ twitched head and body, but did not recover.
- (3) After sixteen hours submergence larvæ twitched, some could roll up a little, but none recovered.
- (4) After ten hours submergence some could roll up and crawl away, and one in ten recovered completely; the rest died.
- (5) After eight hours submergence, 4 in 10 recovered completely; the rest died.
- (6) After six hours submergence, 5 in 10 recovered completely.
- (7) After one hour submergence, all recovered.

This resistance to submergence is very variable, and it was not considered of sufficient importance to experiment extensively with. One larva was submerged for a short period (ten minutes) and then taken out to recover, and then submerged again for a longer period (twenty minutes). This was repeated six times, increasing the submergence period each time, and then the larva submerged for twenty hours, when it recovered sufficiently to roll up and later to crawl away. This suggests that some form of resistance to submergence was developed in the individual larva, and it was noticed that it had ingested air into the gut after the third submergence, causing it to float on the surface of the water.

Resistance to Starvation.

The food supply of the larvæ may be cut off suddenly, as when a weedy fallow is ploughed. In such a case the larvæ do not die for some considerable time and may survive to attack seedlings which have come up after the cultivation.

In the laboratory small larvæ in the second and third instars were found to be able to survive for about ten days without food at temperatures about 60 deg. Fahr., but at higher temperatures they died off quickly. Larvæ in the fifth instar were found to survive without food for about five days at 78 deg. Fahr. and twenty-two days at 63 deg. Fahr. Larvæ deprived of food when about half way through the sixth instar remained for about ten days in the larval state and then succeeded in pupating, producing undersized pupæ.

Resistance to Cold.

Larvæ of different ages kept at freezing point could not feed and died after ten or eleven days continuous exposure. Pupæ were kept at freezing point for twelve days and then gradually warmed up to about 75 deg. Fahr., when they emerged normally as adult moths. It would appear that in Queensland cold is not likely to be a direct cause of death of *Euxoa radians*, as no period of continuous frost day and night is experienced in the State, nor is the soil subject to temperatures much below freezing point even on winter nights. It may, of course, be an indirect cause of death through the killing of host plants.

Reported Cutworm Outbreaks.

The following list of attacks by cutworms has been extracted from the yearly reports of the Department of Agriculture and Stock, Queensland, and from notes lent by courtesy of Field Assistants of the Agricultural Section:—

TABLE XIV.

REPORTED OUTBREAKS OF CUTWORMS IN QUEENSLAND.

Year.	Species.	Locality.	Crop Attacked.	Month.
1907	<i>Agrotis</i> sp.	Beenleigh	Vegetables ..	..
1908	Ditto	Queensland generally ..	Lucerne ..	..
1909	Ditto	Bowen	Tobacco ..	March
1909	Ditto	Bowenville	Vegetables..	..
1909	<i>Agrotis munda</i> (<i>Euxoa radians</i>)	Degilbo	Onions ..	November
1913	Ditto	Wootha	Onions ..	October
1915	Ditto	Wallumbilla.. ..	Potatoes ..	October
1915	Ditto	Stanthorpe	Vegetables..	December
1915	<i>Agrotis</i> sp.	Atherton and Townsville ..	Maize ..	October and November
1915	Ditto	Mundubbera	Maize ..	October and November
1916	Ditto	Capella and Mungallala ..	Cotton ..	November
1917	Ditto	Cleveland	Marjoram ..	October and November
1922	Ditto	The Downs and Condamine	Cotton	October and November
1922	<i>Euxoa radians</i> Guen.	Dulacca and Miles	Cotton ..	October and November
1923	Ditto	Mulgeldie (light attack) ..	Cotton ..	October
1924	Ditto	Monal Creek (light attack)	Cotton ..	November
1925	Ditto	Biloela (medium attack) ..	Cotton ..	October
1926	Ditto	Biloela (heavy attack) ..	Cotton ..	October
1926	Ditto	Kilcoy	Maize ..	October
1926	Ditto	Coominya	Grape Vines	October
1926	Ditto	Mundubbera	Cotton ..	October
1927	Ditto	Monto (light attack) ..	Cotton ..	September

It was found on examination of weather records for the years of attack, that in all cases where *Euxoa radians* was the cutworm concerned, the period of attack was dry, and usually preceded by a dry period. The most serious and widespread attack recorded occurred in 1926. (See graph 13.) This was preceded by four dry years in which slight attacks occurred, so that the effect of a series of dry years appears to be cumulative.

The reported outbreaks of cutworms at Atherton and Townsville are interesting, as both these localities have a normal rainfall of about 50 inches yearly, and the year of damage, 1915, is referred to in the report of the Department of Agriculture and Stock as a "drought" year in the affected area. Normally it would seem that the heavy rainfall keeps the cutworms in check, but that in the dry year their destructive range approached the coastline more closely than usual, following their optimum rainfall conditions.

It must be remembered that near the coast in well-drained areas of suitable soil some damage is done every year by cutworms of the species under consideration, but the mass outbreaks occur only after periods of dry weather which have allowed them to breed up to large numbers, and during dry weather which permits their survival.

The rainfall area over which most serious attacks occur lies between the 20-inch and 60-inch isohyets, but that is because most of the crops which it attacks grow within those rainfall limits, not because the species does not occur elsewhere. The natural habitat extends into more arid regions where the yearly rainfall is from 15 inches upwards and, where the species is present, favourable conditions over a period permitting a series of broods to develop will always bring up the numbers to pest proportions. In dry areas where the food supply is not continuous *Euxoa radians* cannot survive.

The evidence available suggests that heavy outbreaks are the result of local increase of the pests during favourable periods rather than from mass invasions from distant areas.

Host Plants.

Being a drought resistant species it follows that the natural food plants of *Euxoa radians* should be xerophytic in type. The principle foodplant of the species is pigweed (*Portulacca oleracea*), a fleshy low-growing annual with a series of generations each year. The distribution of the insect in Queensland conforms to a considerable extent to that of the pigweed, the latter being xerophytic and cherczophytic in habit, extending from the coast to the western border of the State in favourable situations on waste or fallow lands.

In spring, various thistles and wild carrots coming up with the first rains, form the host plants of the species, and these are followed by pigweed which lasts through summer and autumn in most places right on to the winter period, when it is killed by the frosts. In the coastal areas, however, pigweed grows in a series of generations continuously right through the winter in sheltered spots and the breeding of *Euxoa radians* is also continuous.

The thistles (*Sonchus oleracea*) can tolerate fairly arid conditions owing to their deep tap roots, are succulent in growth, and it has already been noticed that the resistance to aridity of the cutworm is bound up with the presence of abundant succulent food.

In a general way pigweed grows on sandy soils in open spaces where it can compete successfully against the less drought resistant grasses, and this is exactly the situation favoured by the cutworm, so that the insect and plant localities bear a close relationship to each other.

In areas of high average rainfall (say over 40 inches) pigweed does not usually occur in large areas in the open bush, but is found mainly

in cultivated land. In such areas the principal breeding ground of the cutworm is cultivated land, so that perfectly clean cultivation of crops and fallows would act as a partial natural control of the numbers of cutworms. In drier areas, however, there are frequently thousands of acres of virgin bush covered in late spring, summer, and early autumn with a mass of pigweed. In such cases there is an unlimited food supply for the species to breed up on, so it cannot be argued that clean cultivation will control the incidence of the pest. It can be said, however, that clean cultivation will form a less desirable place for the moths to oviposit in than weedy fields.

Fortunately those localities where pigweed grows in large patches in the bush do not usually coincide with areas of agricultural land, but are mainly pastoral, and being such, pigweed may form a fairly good grazing crop.

The following is a list of the host plants, both cultivated and wild, on which the cutworm has been seen to feed:—

TABLE XV.
HOST PLANTS OF *Agrotis radians* GUEN.

Family.	Common Name.	Scientific Name.
Ampellidæ	Grape vine	<i>Vitis vinifera</i>
Compositæ	Sow thistle	<i>Sonchus oleracea</i>
	Noogoora burr	<i>Galinsoga parviflora</i>
Cruciferæ	Turnip	<i>Xanthium strumarium</i>
	Beetroot	<i>Brassica rapa</i>
	Cabbage	<i>Beta vulgaris</i>
Gramineæ	Maize	<i>Brassica oleracea</i>
	Wheat	<i>Zea mais</i>
	Oats	<i>Triticum sativum</i>
	Sugar-cane	<i>Avena sativa</i>
Labiatæ	Marjoram	<i>Saccharum officinarum</i>
Leguminosæ	Peas	<i>Origanum vulgare</i>
	Beans	<i>Pisum sativum</i>
	Lucerne	<i>Phaseolus spp.</i>
Liliacæ	Onions	<i>Medicago sativa</i>
Malvacæ	Cotton	<i>Allium cepa</i>
Papaveracæ	Fumitory	<i>Gossypium spp.</i>
Portulaccacæ	Pigweed	<i>Fumaria parviflora</i>
Solanacæ	Tobacco	<i>Portulacca oleracea</i>
	Potato	<i>Nicotiana tabacum</i>
	Tomato	<i>Solanum tuberosum</i>
Umbelliferæ	Carrot	<i>Lycopersicum esculentum</i>
Zygophyllæ	Bullhead	<i>Daucus carota</i>
		<i>Tribulis terrestris</i>

There may be some chemical affinity between the various host plants of *Euroa radians*, but they belong to widely separated families, and no apparent relation between them can be seen.

Prediction of Cutworm Outbreaks.

Coming now to the summing-up of the possibilities of predicting outbreaks of *Euroa radians* it would be well to note the factors known, as against the factors unknown.

Hinds²¹ summarises many of the difficulties in the way of prediction, but admits that "there are phases of insect multiplication studies to which the 'Theory of Probability' may be applied."

Widespread outbreaks of great intensity are rather rare, so that it is obvious that a special set of circumstances is necessary for an outbreak to occur. A table of the climatic factors considered to be favourable to development and multiplication, contrasted with factors unfavourable to these, is given below:—

TABLE XVI.

FAVOURABLE.	UNFAVOURABLE.
<i>Summer.</i>	
Suitable temperatures (see section on temperatures) for larval development and survival of all stages.	Unsuitable temperatures. Excessive heat
Moderate rains without excessive humidity.	Torrential rains and high atmospheric humidities.
<i>Autumn.</i>	
Temperatures decrease gradually, rainfall light.	Sudden early frosts, killing food plants.
Relative humidity moderate.	Heavy rainfall with excessive humidity.
<i>Winter.</i>	
Rainfall light.	Rainfall heavy.
Temperatures low and fairly regular.	Temperatures erratic with warm spells of humid weather.
<i>Spring.</i>	
Moderate early rains to bring up food plants followed by dry period.	No early rains followed by heavy late rains.
Temperatures rising steadily without late frosts.	Sudden late frosts.

In considering the unfavourable climatic conditions, it would be well to suggest the reason for their effect on the cutworms.

High Atmospheric Humidity.

Feeding on succulent food as it does, it is necessary that surplus water should be easily cleared from the system of the cutworm or a water content greater than the optimum will be developed. A dry air will carry off this surplus moisture and also reduce temperature by evaporation, whereas a humid air will not remove surplus water nor will it reduce temperature. A water content greater than the optimum will reduce metabolism and induce an unhealthy state prone to disease. If a high humidity be combined with a high temperature, then the case becomes critical, for the high temperature tends to accelerate metabolism and activity, while the presence of surplus water inhibits it. This leads to an unhealthy digestive system and to disease and death.

Excessive Rainfall.

Sandy soil can tolerate much rain without becoming sodden, but soils of a slightly heavier nature are apt to become sticky after heavy rain. This wetness not only hampers the cutworm's movements mechanically in the soil (young larvæ cannot survive in wet soil), but tends to clog up the spiracles, and in sticking to the skin prevents evaporation therefrom. It may be that heavy rains alter the chemical character of the host plants on which the larvæ are feeding and so indirectly affect them, but that is conjectural. Heavy and continuous rains then will restrict survival of cutworms to well-drained sandy localities.

Irregular Temperatures.

Sudden early frosts will kill host plants and so, indirectly, the cutworms, and so in autumn may reduce considerably the brood going into winter quarters. Unseasonable warmth and moisture during a

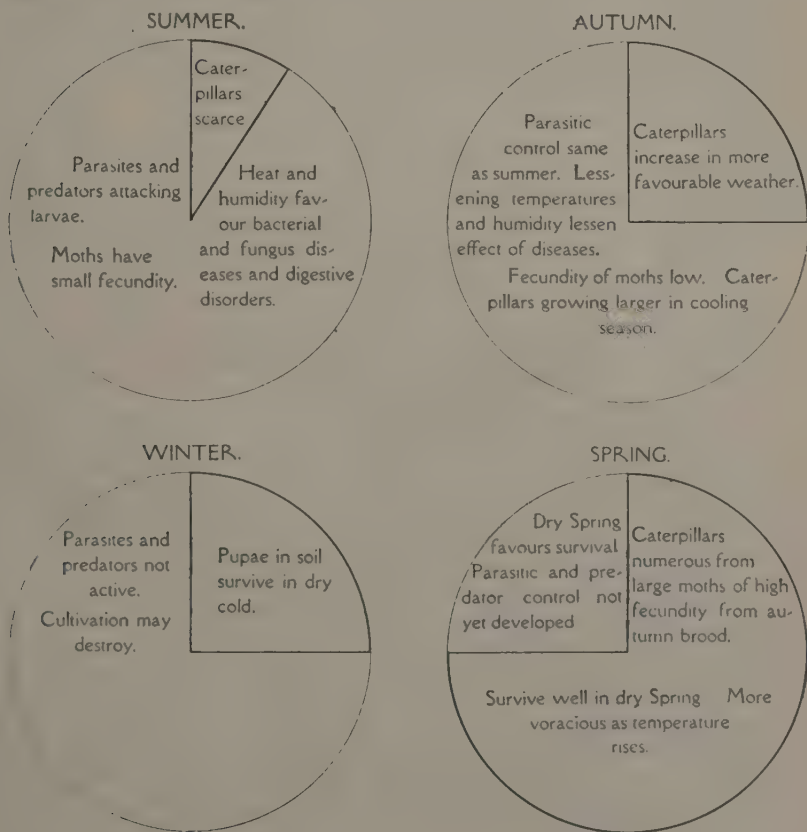
few weeks in winter may bring out the adults, prematurely, so that their offspring may succumb to early spring frosts later on.

Early spring warmth with insufficient moisture for plant growth may bring out the moths before food plants are available for their offspring, and if rains are too long delayed they may die before ovipositing.

Very high atmospheric temperature may kill all stages of the species during heat waves so that excessive heat may be a factor in the control of the species. There is too little available evidence on this point to make any definite statement at present.

Damage to crops generally is most common in spring. In the case of cotton, spring is the only season when damage is possible, as the seedling stage is the vulnerable one, but even in the case of truck crops spring is the most destructive period, with an attack of less severity in autumn. The reasons for the greater incidence of the pest in spring in a year favourable to the multiplication of cutworms are shown diagrammatically below. The diagrams appear to suggest that there are only three broods in the year, but four or even five are possible.

The diagrams are applicable to areas behind the coastal ranges where most of the cotton is grown.



Natural Enemies.

These have been touched on already, but no comparative estimate of their control values given.

In the dry spring when cutworm damage is most rife, parasitism incidence seems to lag behind the incidence of the pest itself. When a heavy attack has got well started, however, and the size of each individual cutworm has increased, then parasites become more active against them. Many parasites and predators attack only the later instars (fourth, fifth, and sixth), so that the younger stages can develop free from their ravages.

A continuance of climatic conditions favourable to the development of cutworms gives the parasites and predators an opportunity to increase and effect a partial control. In this the bracons are very active, being, as far as has been observed, the most useful parasites on *Euxoa radians*. In some situations the ichneumon (?) ecto-parasites are fairly common. Egg parasites and the two species of tachinids already mentioned also exact their toll. In the main, however, it appears that when climatic conditions are favourable to the breeding up and survival of the cutworms they will increase in spite of the natural enemies, over at least a considerable period, and that the sudden and drastic cessation of attacks and reduction of numbers are due to the onset of meteorological conditions unfavourable to their survival, and favourable to the development of digestive disorders and of diseases.

It is not suggested that natural enemies could not control *Euxoa radians* if it were to increase indefinitely over a long period, but that probably because it is controlled to such a degree by climatic restraints parasites do not get sufficient momentum to control its severe outbreaks. One may adopt the point of view that the parasites and predators normally keep *Euxoa radians* in control and that it requires a particularly favourable period or set of circumstances for the insect to become highly destructive.

This way of looking at it does not, however, take away from the value of correlating meteorological conditions with cutworm activities in the attempt to predict outbreaks.

Periods which are climatically favourable to the cutworm may be unfavourable to the survival and increase of the main parasitic controls, but before this could be determined each individual parasite would have to be studied from that point of view so that the whole biological fabric could be followed, and the complex interplay of the many forces understood. This is no doubt the ultimate aim of research, but for the practical control of a species can be followed only partially.

An aspect of the case that for the moment must remain speculative is connected with those areas which normally most nearly approach ideal climatic conditions for cutworm survival. In such areas control must lie with either limited food supply and suitable soils, or with parasitic control; probably with all three.

Such areas might provide centres for breeding large numbers of cutworms which could spread into neighbouring regions as these offer favourable conditions. They also introduce the possibility of mass migrations of moths from one area to another, and so of heavy attacks in the new area irrespective of the previous season's weather.

No cases of mass invasions of new areas by cutworm moths from a great distance have been observed in Queensland although, no doubt, there is always some desultory spreading of the moths.

Within the State there are localities or "natural" regions within which spread of the moths is easy but from which spread is difficult owing to some topographical barriers such as mountain ranges and barren country; climatic barriers such as dry areas, or areas of excessive rainfall.

In all such natural regions foci exist which are favourable to the survival of cutworms even in unfavourable seasons. Such an area in the humid coastal belt might be a well-drained sandy ridge, or in the case of the more arid interior it might be an alluvial creek bank with good vegetative cover which could provide food and shelter during excessively dry periods.

During times of adversity the cutworms are killed out except in these more or less permanent haunts, and when conditions again become favourable to their increase, they quickly spread within the natural region and, with continuous favourable conditions, beyond it. The point is, that breeding up to pest status occurs within the region itself, and that invasions from other regions have not been observed in Queensland. It has to be remembered that a concentration of moths may occur within any region on suitable host plants, and on cultivated soils when food is scarce, and this is one of the reasons why drought conditions favour severe damage to economic crops.

Years of careful recording of pest abundance, parasite activity, and weather data will be required before the principles underlying cutworm outbreaks can be fully understood.

It is hoped, however, that the matter contained in this bulletin will help towards an intelligent appreciation of the cutworm problem and towards an understanding of how to combat attacks.

It may also have some value in indicating possible lines of investigation for the future.

SUMMARY.

The brown cutworm, the larval stage of the noctuid moth, *Eucoa radians* Guen. is the most destructive cutworm in Queensland.

It is distributed throughout the agricultural areas of the State and annually causes damage to vegetable and field crops. In coastal areas some damage is done all the year round to vegetable crops on light soils, but most of the damage generally occurs in spring and autumn. Once in every few years a widespread and heavy attack occurs in areas just west of the coastal range during the spring months, the crops attacked being seedling cotton, young maize, and the young growth of grape vines.

The larval body is well adapted to the subterranean habit of life, and the reduction in the length of the epicranial stem in the head capsule, causing the mouth parts to point forward, instead of downward, can be taken as a measure of such adaptation. The chaetotaxy of the head capsule and body segments is substantially the same as that described by Ripley⁸ for other noctuid larvæ.

In coastal areas and in frost-free areas inland with an annual rainfall of 20 inches or more, breeding is continuous throughout the year, but in areas visited by frosts, only the pupal instar survives the winter season.

Eggs are laid in batches of varying sizes (in the laboratory from seven to 569), the female moths ovipositing over a series of nights under low-growing weeds or seedling crops in loose, slightly moist soil. A female moth may contain in the ovaries up to 1,200 eggs in all, this high fecundity allowing the species to breed up rapidly to pest proportions under favourable conditions.

There are six larval instars; pupation takes place in an earthen cell in the ground.

The rate of development of all stages of *Euroa radians* Guen. varies with temperature; the growth rate increasing proportionately with rise in temperature between 20 deg. C. and 28 deg. C. Outside this range of "medial" temperatures the relation between growth rate and temperature is not directly proportionate.

The time taken to complete a generation from egg to egg is about 106 days at an average temperature of 20 deg. C., and 52 days at an average temperature of 30 deg. C. Variable temperatures with wide fluctuations give a faster growth rate than continuous temperatures.

The larvæ show a considerable tolerance to conditions of low atmospheric humidity, but continuous high relative humidity (say 80 per cent. to 100 per cent. rel. hum.) or much wetness of the soil in which they live, particularly if combined with high temperatures, brings on digestive disorders and death.

The species is controlled to a considerable degree by its natural enemies, except when weather conditions are particularly favourable to the former, when its incidence increases rapidly. Its natural enemies include a chalcid wasp parasitic on the eggs, two tachinid flies, a braconid wasp, an ichneumon and a sphegid wasp parasitic on the larvæ, and a bombyliid parasitic on the pupæ.

The distribution of the species is bound up with that of the xerophytic plant pigweed (*Portulacca oleracea*), the plant and the cutworm being both partial to light, well-drained soils. Attacks are common during dry seasons and the effects of a series of dry seasons are cumulative.

The climatic conditions leading up to an attack during any one spring appear to be:—

- (1) A preceding series of dry years.
- (2) Good summer rains followed by a dry autumn, which allows a big autumn brood to develop.
- (3) A cold, dry winter favourable to the successful carryover of the pupæ in the soil.
- (4) Moderate early spring rains with rising temperatures bringing moths from pupation and allowing the sowing and early germination of economic crops, followed by a warm, dry middle and late spring, which favours larval development and survival.

Clean cultivation will help to control the multiplication of the species in some districts, but when an attack is in progress poison baiting the larvæ is the most useful control method.

Paris green, lead arsenate, and calcium arsenate are the poisons most easily procured, and of these the first is quicker in action and more safe in use because of its warning colour.

The following formulae are recommended against the brown cutworm in Queensland:—

- (1) Paris green, 1 lb.; wheat bran (dry), 28 lb.; molasses, 1 quart.

Mix dry, add water and molasses to form a moist, crumbly mash, and apply in the evening.

- (2) Calcium or lead arsenate, 1 lb.; wheat bran (dry), 16 lb.; molasses, 1 quart.

Mix dry, add water and molasses to form a moist, crumbly mash, and apply in the evening.

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APPENDIX.

Notes on some attacks by other noctuid caterpillars in Queensland, 1927-1928 season.

During a careful study of the species *Euroa radians* Guen. any reported severe outbreak of caterpillars was visited, whatever the species, so that general data on caterpillar attacks could be collected.

Agrotis ypsilon Rott.

This species was often found associated with *Euroa radians*, but proved to be more tolerant of excessive soil moisture than the latter. In one case young cabbage plants were attacked in a field from which flood waters had receded only a few weeks before.

In September and October, 1927, some damage was done to cotton seedlings by this species in the Mundubbera district. Caterpillars from that area, retained in the laboratory, made earthen cocoons in October and activated as caterpillars until February, 1928, when they pupated. They emerged adult towards the end of March, 1928.

Agrotis ypsilon was very destructive to vegetables in suburbs of Brisbane from April to June, 1928, and did considerable damage to young lucerne near Laidley during the same period.

Caterpillars collected in June on strawberries at Capalaba, near Belmont, pupated in July and emerged adult in late August.

In autumn and spring this cutworm is usually to be found associated with *Euroa radians*, but in semi-arid conditions the latter predominates to a marked degree, while in conditions of excessive moisture the former is much more prevalent.

In 1928, a few weeks after the floods had receded in the Dawson Valley, great numbers of caterpillars of this species were seen in the areas recently flooded. Near Goovigen, a very heavy attack was observed.

Spodoptera mauritia Boisd.

The caterpillar of this moth did considerable damage to couch grass lawns in and near Brisbane during March, April, and May, 1928.

A serious outbreak of caterpillars was reported near Pimpama Island in March and April, and investigation showed that this was the species concerned. Many acres of paspalum grass were completely razed to ground level, and all graminaceous plants such as maize, sugar-cane, &c. were attacked within the affected area. The attacks originated in waste areas of swamp couch grass and spread outwards as the caterpillars grew in size and voracity. So immense were the numbers that the ground seethed with caterpillars hurrying towards new feeding grounds. They swept over grazing fields and even crossed swamps which were covered with dense growths of swamp couch grass. The portions of the

grass above water were eaten off to water level, and the caterpillars crossed by the severed stem tops.

Birds came to the rescue, parasitism became severe, and cooling weather slowed down the reproduction rate of the pest, so that no later attacks took place that year. Parasites of the hymenopterous genus *Lissopimpla* were found to be common in the pupæ.

The district is low-lying and marshy. The excessive rainfall and flooding of the summer and early autumn of 1928 would appear to have favoured the species and suppressed the parasitic and predatory enemies. At the same time the excessive moisture in the soil made the grasses soft and succulent, and so more suitable as food for all stages of the caterpillars.

Whether both of these factors operated to cause the serious outbreak or which was the more important factor could not be determined, but what stood out clearly was the correlation between excessive wet and outbreaks of the pest.

***Remigea frugalis* Fabr.**

In May, 1928, severe damage was done to paspalum grass in the Cooroy district. In this case the grass was not razed to the ground, but the outer leaves were left to wither, while the inner shoots were eaten off continuously as they appeared. The caterpillar mainly concerned with this damage was a long yellow-brown semi-looper of the species named.

The grazing fields attacked looked as if blasted by drought. Some farmers had run a fire over the withered leaves to kill the caterpillars and pupæ hiding there, but a general feeling existed against this practice, as paspalum recovers but slowly from the effects of fire.

When about to pupate the larvæ draw together a few withered leaves near the base of a stool and spin a loose silken cocoon in which pupation takes place. In this instance, too, there appeared to be a correlation between excessive moisture and pest outbreak.

A parallel case is reported from America.²² In that case the insect concerned was an allied species—*Mocis* (*Remigea*) *repanda*—the damage being done to graminaceous plants. The severe outbreak came in a period of excessive rainfall which followed a very dry period.

In the case of the attack at Cooroy, in Queensland, and in the American outbreak, the army worm *Cirphis unipuncta* Haw. was present, along with the *Remigea* spp., but in much smaller numbers.

In the case of the four insects considered, it is clear that the outbreaks of *Remigea frugalis* and *Spodoptera mauritia* were positively correlated with excessive precipitation, that *Agrotis ypsilon* was an intermediate type, and that *Euxoa radians* survived best under semi-arid conditions.

A VALUABLE JOURNAL.

A Woombye Orchardist writes: "I think the Journal is honestly worth pounds to every man on the land."

STATE FARM, HOME HILL.

THIS property, aggregating 206 acres in area, the major portion of which is irrigable and suitable for cane production, is to be offered for sale, tenders being called for the purchase of same. Tenders, on forms provided for the purpose, will be received at the Department of Public Lands, George street, Brisbane, up till noon on Saturday, 17th January, 1931.

Conditions of Sale.

The Farm is to be sold as a going concern on a walk-in, walk-out basis.

Terms: One-fifth cash, balance over a period of 10 years, payable half-yearly with interest at 6 per cent. per annum.

Tenders should be accompanied by a preliminary deposit equalling 2 per cent. of the amount of the tender.

The highest or any tender will not necessarily be accepted.



PLATE 4.—CANEFIELD No. 7. E.K. 28. 7.9 ACRES.

Description of Land.

Situated north-easterly of and within half a mile of the township of Home Hill, comprising two blocks divided by Burdekin Road, which form part of Inkerman Repurchased Estate within the Inkerman Irrigation Area.

(a) 106 ac. 2 rd. 19 pls., known as Lennox's Farm.

(b) 99 ac. 1 rd. 21 pls., known as the Town Block.

The whole described as portion 160, parish of Inkerman, county of Salisbury.

Purpose for which the Farm was Established.

The farm was established for experiment purposes at the time of the initiation of the Inkerman Irrigation Scheme, and has since been carried on as such, special attention having been given to sugar-cane experiments in the way of irrigation, fertiliser and varietal tests.

Careful records of yield and production costs have been kept, and the yields shown under the heading of "Cane Crops and the Marketing of Cane" are in accord with the office records. A variety of crops has been tested at the Farm to determine their suitability to the district and their economic possibilities under local conditions.

Improvements.

A good deal of clearing and development work has been carried out. The cultivation land on Lennox's Block, some 80 acres in extent, has been graded for irrigation purposes. On the Town Block 45 acres are cleared and fit for the plough, a portion of which—19 acres—has been graded. Substantial improvements have been erected on the latter area, comprising—

Manager's Residence—45 feet by 45 feet on 6 feet blocks, with verandahs on three sides. Four rooms in main building, with kitchen and pantry; bathroom, and small bedroom on end of verandah; also an office under the house.



PLATE 5.—MANAGER'S RESIDENCE.

Foreman's Cottage—42 feet by 10 feet; verandah back and front, with bathroom on end of verandah. Detached kitchen, 16 feet by 10 feet.

Farm Buildings—Erected in quadrangular form, comprising 16 stalls for horses 10 feet by 6 feet, loose box, chaff room, workroom, and implement shed.

Main Water Service.

Comprises two wells about 50 feet deep, lined with 6-foot diameter concrete cylinders; such being fitted with electrically-driven motors, centrifugal pumps and accessories, representing the standard equipment installed by and the property of the Irrigation Commissioner.

Pumping capacity, No. 1 Well (Lennox's Block), approximately 40,000 gallons per hour.

Pumping capacity, No. 2 Well (Town Block), approximately 40,000 gallons per hour.

Existing Water Rate.

£5 per acre per annum, on a benefited area of 70 acres, payable by purchaser.



PLATE 6.—CONCRETE-LINED CHANNEL, LEADING FROM NO. 1 WELL, LENNOX'S BLOCK.

Domestic Water Service.

One 4-inch centrifugal pump is installed on one spear head and provides approximately 300 gallons per minute for supply for residences and stables, also for irrigation of garden plots. This pump is driven by one 8 h.p. "G.E." motor, which provides power for chaffcutting purposes in addition to pumping duty.

This material also is the property of the Commissioner for Irrigation and Water Supply.

Irrigation Channels, Etc.

Fifteen chains of open concrete channel and 9 chains of 18-inch Hume piping are in use at No. 1 Well, and 8 chains of 18-inch Hume piping at No. 2 Well, with an aggregate of about 50 chains of main open ditches on both blocks.

Drainage Well.

One concrete-lined well 20 feet deep, with iron grid cover, is situated on Lennox's Block.

Fencing.

3.4 miles of boundary fencing, 5 plain and 1 barb wires supporting wire netting; also 1.1 mile of 3-wire subdivision fences, with the necessary cyclone gates (4).

Implements.

These comprise:—Table-top wagon; 1 truck carrier, with key and rail points; dray; Mayne and White chaffcutter; L.H.C. grain and fertiliser drill; No. 4 McCormack mowing machine; hay rake; Dictator

cultivator; Cotton King disc cultivator; two-row scarifier; 1 new and 1 old single-horse scarifier; pony plough; 2 drill ploughs; 1 sub-soiler; 1 butterfly attachment; 1 Louvre grader; 1 Buck scraper; 1 smoother; 2 sets iron peg-tooth harrows; hand-power corn sheller; McKay maize planter and cultivator; 8-disc one-way Sunshine cultivator; wooden roller; 2 only double disc Sunshine ploughs with 4 spare discs; 1 old single-horse maize planter; 6 cwt. platform scales.

Tools and Sundries.

These comprise a wide range of miscellaneous plant and tools used in the working of the property, full lists of which are available.

Horses and Harness.

Twelve draughts (Clydesdales and Suffolk geldings and mares), and one saddle horse, together with a full equipment of harness for all farm purposes; also a saddle and bridle.

Seven of the draughts are good, useful, farm horses, in good working order; five are aged and only fit for intermittent work.



PLATE 7.—PLOT "A," No. 9 FIELD. BADILA. PLANTED JUNE, 1929. IRRIGATED; SHORT ROW HAWAIIAN SYSTEM.

Cane Crops and the Marketing of Cane.

The Farm is connected by tramway with the Sugar-mill at Carstairs, the tramline being laid alongside Lennox's Block, in close proximity to the cane crops.

The cane assignment is 72 acres gross—54 acres net.—34 acres are under plant cane and 5 acres first ratoons of Badila, E.K. 28, and other varieties.

This year's crop of cane amounted to over 1,439 tons.

Gross and Average Returns of Cane, 1922 to 1929, inclusive.

Year.	Tons Plant.	Tons Ratoons.	Tons Stand-Over.	Totals.	Average Yield per Acre in Tons.	G.C.S. on Milling Cane.	Wet Season Rains.	Total Rain and Irrigation during production.
						Per cent.	Inches.	Inches.
1922 ..	629	..	..	629	27.83	12.53	14.30	79.76
1923 ..	473	273	..	746	18.20	14.20	2.06	48.81
1924 ..	515	245	..	760	27.00	13.95	15.34	62.00
1925 ..	635	64	..	699	31.80	12.20	23.35	92.19
1926 ..	383	185	309	877	17.72	15.55	9.67	100.80
1927 ..	477	296	..	773	25.75	15.15	28.83	74.27
1928 ..	763	141	..	904	27.16	14.07	31.18	68.13
1929 ..	1,188	217	..	1,405	35.01	13.53	35.54	69.73
Averages	633	178	38	849	26.31	13.91	..	74.46

NOTE.—Notwithstanding irrigation the yield of cane is largely governed by the "wet season" rainfall (January, February, and March).

Other Crops.

	Acres.		Acres.
Oranges ..	5	Pineapples ..	1½
Cavendish bananas ..	2	Lucerne ..	1½



PLATE 8.—STOOL OF CAVENDISH BANANAS.

Summary.

This property is in a good district, has an attractive cane assignment, and offers exceptional advantages and conveniences to any person who wishes to step right into a going concern.

Further particulars, together with Tender Forms and full lists of tools, sundries, &c., are obtainable on application to the Under Secretary, Department of Agriculture and Stock, Brisbane, the Secretary, Land Administration Board, Brisbane, or at the Lands Offices situated at Townsville, Cairns, Innisfail, Bowen, Mackay, and Bundaberg.

STATE FARM, HOME HILL.

INFORMATION IN RESPECT OF CANE CROPS TO 30TH NOVEMBER, 1930.

1 JAN., 1931.]

QUEENSLAND AGRICULTURAL JOURNAL.

39

IRRIGATION AND RAINFALL (INCHES).										
YEAR 1929 (8 MONTHS TO 31ST DEC.), YEAR 1930 (TO 30TH NOV.).										
Date Planted or Ratooned.	Field or Plot Number with Area of Plot.	Variety.	IRRIGATION.			RAINFALL.		Tonnage to Mill.	Condition of Crops, etc., as at 30th Nov., 1930.	
			Irrigation.	Rainfall.	One Month before Planting or Ratooning.	After Planting or Ratooning.	One month before Planting or Ratooning.			After Planting or Ratooning.
1929.										
September	No. 5 Field	E.K. 28	13.1	4.80	..	9.14	0.05	19.99	134.62	2.50
August	Plot E of 6	Badilla	8.9	4.80	..	6.10	..	19.99	390.0	..
October	Plot C of 6	Badilla	17.51	4.68	..	13.94	0.07	18.79	35.76	..
May	No. 9 Field	Badilla	27.34	10.38	..	33.23	6.10	20.50	98.14	23.98
May	Plot D of 6	Mixed	12.93	10.34	..	16.68	6.10	20.50	121.14	8.87
October	No. 2 Field	Badilla	10.88	4.75	..	16.40	0.07	20.50	54.96	..
June	Plot B of 6	Badilla	13.43	4.80	..	16.47	..	20.50	125.49	23.80
July	No. 7	E.K. 28	17.63	4.80	..	29.65	3.04	20.50	402.00	..
November	No. 1	E.K. 28	5.30	4.68	..	..	..	20.50	..	18.60
			40.30							
1930.										
April	Plot F of 6	E.K. 28	..	..	..	5.87	1.60	10.00	..	Full strike and stood out well
May	No. 4	E.K. 28	..	..	..	5.62	..	10.00	..	Full strike and stood out well
June	No. 3	Badilla	..	..	..	..	1.71	7.45	Planted or 1931 sason	Full strike and secondaries showing up
July	No. 8	Badilla	..	..	..	..	0.51	5.74	..	Good
September	Plot E of 6	Korpi	..	..	2.50	..	..	5.74	..	Late, but promising
September	No. 1	Korpi and Badilla	..	..	5.90	..	..	5.74	..	Late, but promising
			34.80							
NOTE.—Planting in all cases 5 feet by 14 inches.										

RURAL ROUTES IN QUEENSLAND.**THE WORK OF THE MAIN ROADS COMMISSION.**

A web of well-constructed arterial highways is spreading gradually over Queensland. This is the result of a soundly organised programme by the Main Roads Commission in co-operation, where necessary, with Local Authorities. In the ninth Annual Report of the Commission, from which the subjoined notes are taken, a year's work is interestingly reviewed.

Through the courtesy of the Commission we are enabled to reproduce some of the excellent plates included in its report, and which illustrate the immense value of its services to the State.

SUMMARY OF OPERATIONS.

EXPENDITURE on roads during the past year, including all essential charges, was £1,232,712. as compared with £1,141,810 during the previous year.

The Commission willingly undertook its share in the road works programme decided upon by the Government, and with the approval of the Minister for Railways and Roads (Hon. Godfrey Morgan) has subsidised the Unemployment Relief Fund in the matter of relief works on main roads—such subsidy consisting of the provision of materials, floating plant, supervision, and cost of plant hire on the jobs. All labour costs are reimbursed from the Unemployment Relief Fund.

The selection of works has been confined to those which would not ordinarily have been included for some considerable period in the ordinary main roads programme. All works are subject to the approval of the Minister for Labour and Industry (the Hon. H. E. Sizer).

It is gratifying to report that the whole of the works started at short notice throughout the length and breadth of the State practically without a hitch. Complete liaison has been established with the Department of Labour and with Local Authorities who have been utilised to a very large extent as the constructing authorities, as in the case of main roads works.

Local Authority unemployment relief schemes not on main roads have been controlled and inspected by the officers of the Commission.

Labour Efficiency.

An opinion which the Commission has long held in regard to available labour in Queensland has been strikingly confirmed in connection with this scheme. It is that there exists only a very small percentage of unemployables, and our estimate of the efficiency of such casual drafted labour has been fully realised.

The resources of the Commission have been made available to the Minister for Labour in the direction of controlling works other than road works, such as land clearing and other operations.

Research.

The research work undertaken by the Commission's officers in design and construction methods, together with the experimental work, is bearing harvest, and the co-ordination of field works, laboratory work, and design is being steadily improved.

Increased mileage for a given capital expenditure has been the result, and has increased the difficulty of securing sufficient output from the drawing office and survey staff to keep pace with it.

It is becoming increasingly apparent that much of the south-western area adjacent to the railway line will in the near future become of much greater importance in dairying, agricultural, and pastoral industries than hitherto owing to the eradication of prickly pear under the direction of the Prickly-pear Land Commission.

Considerable attention to the construction of feeder roads to the railways will be given in this area, which contains millions of acres.

Graphic representations of the average annual and monthly evaporations, together with the rainfall precipitations during the growing period, in the area referred to, shown in comparison with other wheat-growing areas, are appended to the Report to illustrate the reason for this point of view.

Our rich dairying and agricultural areas are worthy of even more attention to road construction than has been given. This is well instanced by the results achieved by the Commission in Gayndah and Kingaroy Shires and along our coastal belt.

Development in the Mary Valley.

The following letter from Landsborough Shire quoted in the Report indicates the development which is likely to occur as the result of further road and bridge construction along the Mary Valley. The letter refers to the construction of the main road between Landsborough and Brooker's Corner, and improvements to Conondale read by the construction of "Grigor" and Elaman Creek bridges and to maintenance work carried out on this road:—

"Dairying and Pig Raising Industries.—It is estimated that these industries have increased 100 per cent. during the last two years. Prior to the construction of the bridges, the farmers suffered a great loss owing to frequent heavy rains rendering it impossible for them to market their produce. Loss from this cause has now been eliminated. As a result of road improvements, motor transport has superseded horse transport, and as a consequence of this the cost of carting cream has been reduced from 6d. per gallon (horse transport) to 4½d. per gallon (motor transport). The cartage on pigs to Landsborough has been reduced from 7s. per head to 5s. per head.

"Timber Industry.—The motor charge for hauling all classes of timber from Conondale to Landsborough is now 7s. per 100 superficial feet. Previously only pine, cedar, and other soft woods could be removed, as the cost of haulage namely, 15s. per 100 superficial feet—was prohibitive so far as hardwood was concerned. With reduced haulage costs, however, some 500,000 superficial feet of ironbark and other classes of hardwood have been marketed. It is estimated that over 10,000,000 superficial feet, most of which is first-class hardwood and a large quantity suitable for bridge work, are now available, all of which will be hauled over the Conondale to Landsborough Main Road.

"Banana Industry.—Some four or five years ago a small experimental area of bananas was planted, the result being most encouraging, as it demonstrated that the land is eminently suitable for the prolific production of bananas of the highest grade and quality. This has led to the planting of some 200 acres up to the end of last year, most of which area is in bearing. A further 150 acres are being prepared for planting this season. There are several hundreds of acres of land in the district equally suitable for growing this class of fruit. Without the present main road facilities it is doubtful if the banana industry at Conondale would have been a payable proposition. Under the circumstances, the grower finds it a lucrative occupation.

"Agriculture.—The advent of a good main road has made available a large area of rich agricultural land. In addition to maize, most of which is used locally, chiefly for pig-raising, English potatoes are being grown. It is estimated that 100 tons of this commodity are now being forwarded annually to Brisbane markets from Conondale, the reduced motor haulage costs being the sole factor."

A further instance of the benefits of main roads construction and of the general policy of the Commission is evidenced by a letter recently to hand from the Gayndah Shire, a copy of which appears hereunder.

Gayndah Shire, previous to the inauguration of Main Roads work, was a country of blacksoil roads, mostly impassable in wet weather. There have been now some 48 miles constructed by the Main Roads Commission, 27 miles of which are on through roads in dairying and agricultural areas.

Other important highways have been constructed in different parts of the State, and the Commission is fully informed of the road needs of every rural community and is in close touch with the Local Authorities in respect of future development.

The accompanying camera record of some of the work undertaken or completed in the course of the year gives a good idea of the influence of the Main Roads Commission on country life in Queensland.



PLATE 9.

KINGAROY—BELL ROAD, WAMBO SHIRE.

A connecting link between the Darling Downs and Burnett Districts.



PLATE 10.

KOLAN RIVER BRIDGE, ON THE GIN GIN—MIRIAM VALE ROAD.

This bridge is over a river subject to frequent flooding.



PLATE 11.

TAROOM—WANDOAN ROAD, IN THE TAROOM SHIRE.

A part of the Leichhardt Highway and a valuable feeder to the railway.



PLATE 12.

ROLLING IN SCREENINGS ON THE FIRST BITUMEN COAT ON THE THALLON—ST. GEORGE ROAD.

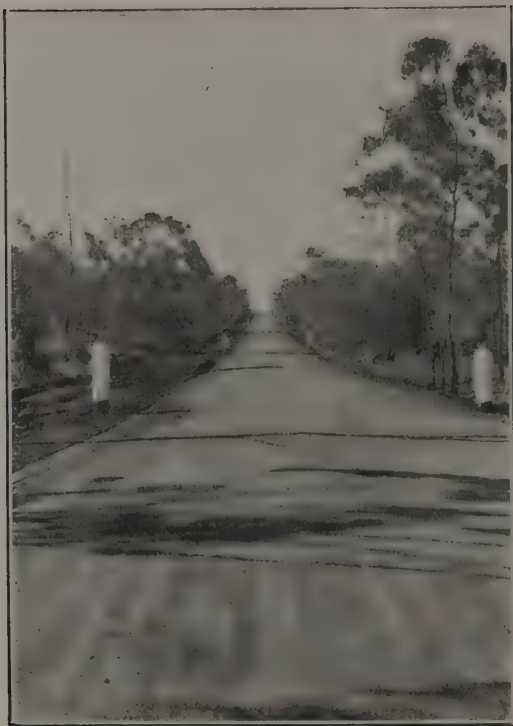


PLATE 13.

STANWELL—RIDGELANDS ROAD, FITZROY SHIRE. A "C" CLASS METAL ROAD SERVING DAIRYING AND AGRICULTURAL CENTRES.



PLATE 14.

A "C" CLASS METAL SECTION OVER HEAVY BLACK SOIL ON THE CLIFTON-ELLANGOWAN ROAD IN CLIFTON SHIRE.



PLATE 15.

BRIDGE OVER THE SOUTH MAROOCHY RIVER, ON THE YANDINA—MAROOCHYDORE ROAD.
Built to replace an old bridge washed away by flood.



PLATE 16.

DAYMAR—ROCKWELL'S ROAD, IN WAGGAMBA SHIRE.
A gravel road which has cost very little for maintenance.



PLATE 17.

SMITH'S CROSSING, OVER THE KOLAN RIVER, ON THE BUNDABERG—INVICTA ROAD, IN GOOBURRUM SHIRE.

This bridge gives access from large canegrowing and dairying areas to Bundaberg.



PLATE 18.

PETRIE CREEK BRIDGE, ON THE YANDINA—MAROOCHYDORE ROAD.

This bridge is a connection between two sections of Nambour township.



PLATE 19.

MENA (OR STEWART'S) CREEK BRIDGE, ON THE INNISFAIL—SILKWOOD ROAD.
This bridge is across a swiftly flowing stream subject to frequent flooding.



PLATE 20.

BURDEKIN RIVER BRIDGE, ON THE AYR—HOME HILL ROAD.



PLATE 21.
CEMENT PENETRATION, INGHAM—HALIFAX ROAD.
A finished job showing evenness of surface.



PLATE 22.
GOONDIWINDI—GUNDABILLA ROAD, IN GOONDIWINDI TOWN.
An example of bladed bitumen mix.



PLATE 23.

A SECTION CONSTRUCTED OF LOAM ON THE GOONDIWINDI—GUNDABILLA ROAD.



PLATE 24.

AN UNIMPROVED SECTION OF THE MOUNT LARCOM—BRACEWELL ROAD IN CALLIOPE SHIRE.



PLATE 25.

AN IMPROVED SECTION OF THE MOUNT LARCOM—BRACEWELL ROAD IN CALLIOPE SHIRE.
Constructed for the carriage to rail of the produce of an important dairying district.



PLATE 26.

CUNNINGHAM STREET, DALBY.

An example of bituminous penetration macadam work.



PLATE 27.

COOMERA RIVER BRIDGE, ON THE MAIN SOUTH COAST ROAD.

This bridge takes the place of a ferry which greatly impaired the efficiency of the road.



PLATE 28.

A TYPICAL WESTERN FLOOD CROSSING ON THE ISISFORD—EMMETT ROAD.
An example of the work being done in the outlying districts of the State.

DEPARTMENT OF AGRICULTURE AND STOCK.

VISIT OF PARLIAMENTARIANS.

AT the invitation of the Minister for Agriculture and Stock (Mr. H. F. Walker) a party of Members of Parliament made an informal inspection of some of the technical branches of his Department recently. The visitors included—The Speaker (Hon. C. Taylor), Mrs. Irene Longman, Dr. P. J. Kerwin, Messrs. J. D. Amund, G. P. Barnes, R. L. Boyd, F. W. Butler, W. E. Carter, E. H. C. Clayton, E. Costello, T. A. Dunlop, J. B. Edwards, E. L. Grimstone, R. Hill, T. Nimmo, T. R. Roberts, E. B. Swayne, and W. J. Wellington.

A tour was made of the Chemical, Pure Seeds, Entomological, Pathological, and Cotton Laboratories, also the Wool and Seeds Stores.

Central Meat Inspection Depot.

The visitors were given interesting demonstrations and explanations of the methods employed at the Central Inspection Depot in connection with the examination of veal and pork for metropolitan consumption.

The depot, which is situated within Departmental precincts, it was explained, is available to butchers and farmers for the examination of carcasses from Monday to Saturday in each week. Thursday and Friday are the busiest days. Inspection is most thorough, and for the year 15,523 carcasses of veal and 7,433 carcasses of pork were submitted to critical scrutiny. The visitors were much impressed with the value of this work, especially in regard to public health. Meat was condemned in their presence and the reasons were clearly demonstrated. They were also shown how easily an unscrupulous butcher might secure an advantage in respect of any lax or incompetent inspection.

Farmers' Wool Scheme.

The wool room was next visited, and the details of the wool realisation scheme instituted by the Department for the benefit of small flock owners was interestingly explained. Clips ranging in quantity from a single fleece to several bales are received for classification and sale. On delivery weights and value a 60 per cent. advance is made immediately and the balance is paid on realisation. The total cost works out at 10s. a bale, and at that figure the scheme is entirely self-supporting. The wool is handled by expert classifiers. Under the system the small grower receives the same consideration and advantages as the large pastoralist in marketing his product. The visitors were impressed with the value of the scheme from every aspect of the wool industry.

Wheat and Maize Breeding.

The seed room was next visited, where the results of grain breeding and cultural tests were displayed in great variety. The system of wheat and maize propagation and improvement was explained in detail, and it was shown how seed wheat bred and distributed by the Department has undoubtedly been of substantial economic value to the wheatgrowers of the State.

Chemists' Laboratory.

From there the visitors went on to the laboratory of the Agricultural Chemist where interesting analytical work was in progress. This laboratory is regarded as one of the most modern and best equipped in the Commonwealth. From a one-man show over thirty years ago it has advanced to its present high state of efficiency both in personnel and equipment. Over a long series of years this Branch has performed much valuable work for the farmer, the results of which are made readily available in the "Queensland Agricultural Journal" and other publications that have an accepted text book value for those pursuing a study of our rural problems. That work covers stock nutrition experiments, pasture improvement, and improvements in fadders, grains, and field crops generally. Both fundamental and applied research are also undertaken in respect of fertilisers, dipping fluids, and stock foods. Added to all these avenues of investigation is the regular routine work



PLATE 29.—VISIT OF MEMBERS OF THE QUEENSLAND PARLIAMENT TO THE DEPARTMENT OF AGRICULTURE AND STOCK.

The Minister (Hon. Harry F. Walker) is third from the left. On his left are Mr. W. J. Wellington, M.L.A., Mrs. Irene Longman, M.L.A., Hon. Chas. Taylor (The Speaker), and Mr. R. L. Boyd, M.L.A. In the second row, left to right, are Mr. J. B. Edwards, M.L.A., Dr. P. J. Kerwin, M.L.A., Major E. Costello, M.L.A., Messrs. J. D. Aitmand, M.L.A., E. H. C. Clayton, M.L.A. (immediately behind Mr. Taylor). Back row: Messrs. E. L. Grimstone, M.L.A., F. W. Butler, M.L.A., T. R. Roberts, M.L.A., and T. A. Dunlop, M.L.A. Departmental officers in the group are Messrs. E. Graham, R. Wilson, R. P. Short, and J. F. Reid.

embracing a comprehensive series of analyses of great importance to the manufacturing as well as to the producing side of rural industry in Queensland. The chemist also collaborates with the agricultural specialists in carrying out regular series of field experiments, including pasture renovation and fodder plot trials.

The next call was made at the laboratory of the Pure Seeds Branch, where it was demonstrated how the farmer is protected from imposition in respect of the quality of seeds, stock foods, fertilisers, and pest destroyers.

So interested were the visitors in the work of the technical services already inspected, that it was impossible to carry out the full programme arranged. Another visitation, however, has been planned for the Parliamentary recess, when it is hoped that it will be possible to make a complete inspection of all the scientific and technical services available to the Queensland farmer.

Departmental Services.

Afterwards the party assembled in the Minister's room where a fine range of samples of Queensland-grown tobacco of light, medium, and dark types for pipe and cigarette use, mainly from Harvey's Range and Home Hill, were displayed for their inspection. The aroma of every sample elicited very favourable comment.

In expressing appreciation of the visit and the interest shown in the activities of his Department, Mr. Walker said that the question had sometimes arisen as to what the Department was doing, and he had accordingly invited members of the Parliament to pay an informal visit and see and estimate for themselves the work of his technical officers and its value to the community. He paid a tribute to his staff, saying that he was proud to be associated with the highly-qualified men who were performing such valuable services for the primary industries. They possessed a fine record of work well done, of sustained effort, and continued achievement, from which had come much of their wealth and progress in rural industry.

The agricultural, chemical, and associated laboratories compared favourably with those of the other States, and were regarded as among the best staffed and equipped of their kind in the Southern Hemisphere. Sir Arnold Theiler, Dr. J. B. Orr, of the Rowett Institute, Sir John Russell, of Rothamsted, and other eminent visiting scientists had all expressed themselves as impressed with the work of his Department, particularly in relation to stock nutrition and pasture improvement. Without the assistance of science, the rural industries would soon revert to a primitive state. Scientific and technical officers were performing much valuable work for the farmer, of which they had had excellent evidence that morning. (Hear, hear!) The results of that work was made readily available in the publications of the Department. He made special reference to the "Queensland Agricultural Journal," saying that it should be in the hands of every farmer. In addition, there was routine work which included a comprehensive series of analyses of great importance to the manufacturing as well as to the producing side of rural industry in Queensland.

The extent of their scientific service to agriculture was very little known generally, added the Minister, and such visits would help to widen public interest in that regard. (Applause.)

Aid to Primary Producer.

Mr. Taylor thanked Mr. Walker for the opportunity he had given the visitors of seeing something of the services rendered to the primary producer by the Department of Agriculture and Stock. He was deeply impressed with the extent and excellence of that service and the efficiency and courtesy of the officers. They all had spent a most interesting and educative hour, and he congratulated the Minister on the great progress the Department was making, particularly in its technical and scientific branches. (Applause.)

Dr. Kerwin said that he had been impressed by the modern laboratories, the scope and value of the work done, and the virility, alertness, and capability of a highly qualified staff. Scientific research had for him a special interest, and among other things he would commend further investigation of the finger cherry, a fungus of which had apparently caused sad cases of total blindness in the North. (Applause.)



PLATE 30.—THE LABORATORY OF THE AGRICULTURAL CHEMIST, DEPARTMENT OF AGRICULTURE AND STOCK.



PLATE 31.—THE WOOL ROOM, DEPARTMENT OF AGRICULTURE AND STOCK.

Small flockowners' clips are here classed and prepared for market under a system that has won the approval of both farmers and wool salesmen.



PLATE 32.—THE CENTRAL MEAT INSPECTION DEPOT, ONE OF THE ANNEXES OF THE DEPARTMENT OF AGRICULTURE AND STOCK. Approximately 25,000 veal and pork carcasses are examined here annually on behalf of farmers and retail meat tradesmen.

NEW FRUIT TOMATO.

Mr. H. Barnes, Instructor in Fruit Culture, writes:—What is regarded as a new variety of tomato has been evolved by Mr. P. E. Donnier, of Kelvin Grove, from seed of a cross between Ponderosa and Sunrise varieties. The plants were sown late in September, and at the time of inspection, 28th November, were about 4 feet high. They were trained on a modification of the stake system. Its luxuriant foliage resembles that of the Burwood Prize variety. Its fruit is big, firm, and fleshy, and forms in large clusters (see illustration). The plants were grown on very poor, red, shaley soil, and stable manure was the only fertiliser used. Mr. Donnier has named the plant "The New Fruit Tomato."

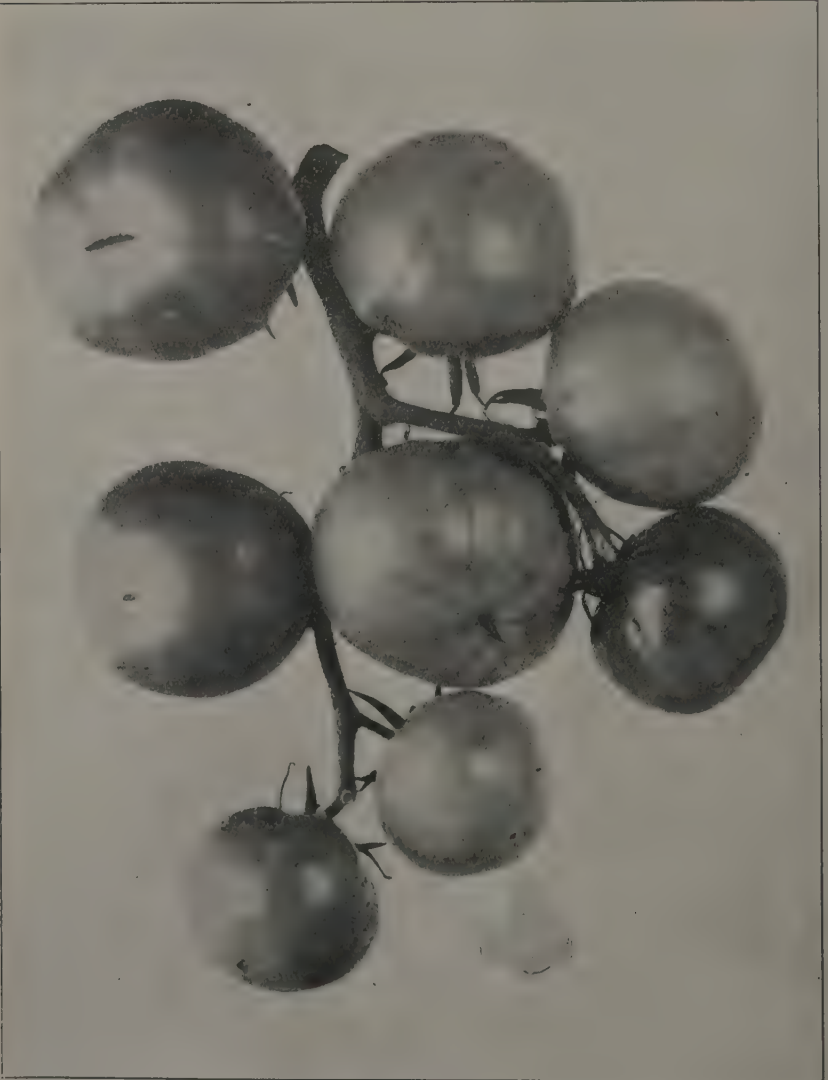


PLATE 33.—NEW FRUIT TOMATO.

DISEASES OF THE PIG.* *end*

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

[Continued from the November issue.]

PART III.

In the preparation of information dealing with Diseases of the Pig, an endeavour has been made to describe in the simplest language possible the various conditions, abnormal and otherwise, associated with the incidence or appearance of disease in swine. The suggested preventive measures and methods of treatment are such as may be successfully carried out by any careful farmer, excepting only in cases where the services of a qualified veterinarian are advised, and in these cases the best methods to follow will be suggested on the spot by the surgeon himself.

The pig is notoriously a bad patient and a difficult animal to handle when indisposed, hence great stress has been laid throughout this treatise on the necessity of preventive measures, for prevention is not only much better than cure, but is invariably less costly and a great deal more satisfactory.

In dealing with methods of treatment and the engagement of qualified aid, it has been realised there are numerous difficulties in the way, because Departmental officers or practising veterinarians are not always immediately available in town or country districts. Again, therefore, we stress that prevention is better than cure, and we might even qualify this further by adding prevention is more necessary than cure.

Mr. Shelton's bulletin, representing as it does much labour and the fruits of careful study and observation, is a welcome contribution to current pig literature.—EDITOR.

HOG LICE.

HOG Lice (*Hamatopinus suis* Lin.) are small wingless creatures of a dull greyish brown colour that live upon the skin of the pig, feeding upon the moisture of the skin and sucking blood from the tiny blood vessels (capillaries) that abound near the surface of the body. The louse is about the size of a small nail head, its head is very long and narrow and is rounded and conical in front, with five hairs on each side, and towards the sucker three other long hairs. The abdomen is of an elongated oval shape. The feeding apparatus is like a tiny spear, and is forced into the skin in search of blood; close to its point is the mouth.

* The typescript and illustrations of the Farmers' Bulletin on Diseases of the Pig have been submitted to the Chief Inspector of Stock, Major A. H. Cory, M.R.C.V.S., Department of Agriculture and Stock, Brisbane, Queensland.

Copies of the Bulletin may be had gratis on application to the Under Secretary, Department of Agriculture and Stock, Brisbane, Queensland.

In the compilation of this paper the writings of recognised authorities in other States and other parts of the world have been drawn on, and the assistance thus received, also that freely given by other Departmental officers, is acknowledged gratefully.

Hog lice reproduce themselves by means of eggs which the female deposits in protected spots, such as under the arms and along the back and behind the thighs. These eggs (or nits, as they are usually called) hatch out and liberate the young lice, which rapidly develop and become mature. They are very active and creep about among the bristles and shorter hairs. Their legs are provided with pincer-shaped apparatus which enables them to cling to the hair.

It cannot be said that their presence is entirely due to insanitary surroundings, as they are often found on pigs kept under the very best of conditions; still it is a business matter to keep pigs reasonably free from parasites. Strong, healthy pigs are not likely to suffer ill-effects to the extent that weak, anæmic stock are, or those that are improperly cared for and fed on an unbalanced ration.

Ordinarily these parasites are so common as to suggest that they are of very little economic importance, or that the effects of infestation are not worth considering. This is unfortunate, as the economic losses resultant upon infestation are sufficiently serious to warrant every effort being put forward to prevent or eradicate them. It should be remembered that the hog louse is a very active blood sucker and lives on pigs of any age and condition, even on sucking pigs a day or two old. The loss of blood and the irritation caused by their presence seriously interfere with the growth and development of the animals; pigs heavily infested with lice also lose their powers of resistance to other diseases.

Symptoms.

The first indication of infestation will be a severe itching of the skin; in an effort to relieve this the pig will be found rubbing vigorously against fence posts or food troughs.

Treatment.

The best form of treatment is to pen up the pigs and wash them carefully. Then make up a gallon of lice mixture as follows:—Mix together half pint of benzine, half a pint of kerosene, and seven pints of fish oil. Any other vegetable or mineral oil will suffice if fish oil is unobtainable. Best results will follow individual treatment, therefore treat each pig separately. Shake the mixture well before use (keep mixture in a clean oil-can and not in a bottle), then pour a small quantity on the animal and rub thoroughly on the places where the lice congregate, being careful to search inside the ears. If the pigs are not accustomed to being handled, and it is found inconvenient to treat them in this manner, it will be an advantage to use a soft brush or broom on a long handle. Dip this into a dish of the lice mixture and rub along the back, down the hind legs, and about the ears.

Other reliable remedies are:—Equal parts of kerosene and raw linseed oil. Sheep dip should not be used on pigs if it contains arsenic. After treatment the animals should not be exposed to the sun for an hour or two, otherwise sun scald may result. There are several commercial "pig oils" on the market well worth trial in the treatment of external parasites.

As most of the lice nits or eggs are not at once destroyed by the above mixtures, treatment should be repeated at least three times at intervals of eight or ten days. This is necessary in order to destroy the lice that hatch out of the remaining eggs. It is also necessary to

thoroughly disinfect sties and old pig crates and to clean up the yards. In order that clean pigs may be kept free from lice, care should be taken that no pigs are introduced to the piggery until they have been examined and found to be free, for these parasites spread quickly through a herd when once introduced. If, after purchase, any pigs are found to be infested, they should be treated and entirely freed from lice and nits before being allowed to come into contact with clean pigs.

Dipping pigs in a large vat similar to that used for sheep is not advised, as the pig is a difficult animal to handle at all times and strongly objects to being forced into a dip containing strong-smelling fluids. A cheap and effective way of keeping pigs free from lice is to erect half a dozen posts in the pig paddocks and yard. If corn sacks or other bagging saturated with crude, fish, or pig oil are strapped around these rubbing posts the pigs will rub against them and thus free themselves from lice. The sacks should be soaked in oil at intervals of not longer than seven days. Pieces of short-wooled sheep pelt used instead of sacking will also prove quite effective if firmly strapped to the post and kept well oiled. Wire or staple bagging to the posts, as nails alone will not prove effective where pigs are constantly rubbing.

Automatic Hog Oilers.

Though automatic hog oilers have been advertised extensively overseas and are in use abroad, they do not appear to have been a success here. They are expensive and require a good deal of attention, and, unless special care be given to them, their use is not advised. There are several types, but none are at present available in Australia at a price to make them attractive to the pig farmer.

Novel Treatment.

Discussing the matter of treating pigs for hog lice with an old-time farmer recently, the latter remarked that he had never had any trouble among his pigs, for he had made it a practice to give them a good dose of flowers of sulphur in their food every now and then, and this had never failed in keeping the pigs free from lice. This is a novel, though somewhat unreliable line of treatment with pigs, though it is said to be common practice to add sulphur to the food of dogs with a view to keeping them in good health and free from lice, ticks, &c. Another bush remedy is to keep a piece of mutton fat handy and rub the pig's back whenever opportunity offers. A corn core dipped in oil makes a good brush for use in a similar manner.

[TO BE CONTINUED.]

A USEFUL JOURNAL.

A Millmerran farmer, renewing his subscription to the Journal, writes (15th December, 1930):—“ . . . I am pleased to say that I have received every copy of the ‘Journal’ regularly, and I go through it from cover to cover and I always find something of great benefit to me. . . . ”

A Thangool farmer writes (4th December, 1930):—“ . . . The ‘Queensland Agricultural Journal’ is the best farmers’ journal on the market, and I would not like to miss a single copy of it. In every page there is knowledge.”

VARIATIONS IN CREAM TESTS.

By CHAS. McGRATH, Supervisor of Dairying.

VARIATIONS in the percentage of fat in cream delivered from time to time by patrons of butter factories have been the cause of dissatisfaction between a number of producers and factory managements.

The Babcock method of determining the fat content of milk and cream is in general use in the dairy industry in this State, and is a reliable determination.

In the mechanism of nearly all the separators provision is made to regulate the proportion of cream by what is termed the cream screw. When the screw is turned towards the centre of the separator bowl it contracts the cream line and gives a richer or higher testing cream.

If the screw is turned outwards it widens the cream line, and by allowing a larger proportion of skim milk to pass out with the fat gives a cream with a lower fat content.

Apart from the actual mechanical standardisation there are other factors which have a material effect on the fat content of the cream delivered from the separator bowl, or which the following are the most important:—

1. Speed of Separator Bowl.

All separators are manufactured to run at a definite speed, and they will do satisfactory work at the speed specified by the manufacturer.

If the speed of the bowl is increased the centrifugal pressure is increased, which has the effect of condensing the cream, so that a lesser quantity of richer cream is delivered from the bowl.

If the speed of the separator bowl is reduced below the required number of revolutions per minute the percentage of fat content of the cream will be lowered, and will be accompanied by an excessive loss of fat in the skim milk.

A modern separator properly operated will deliver cream with a uniform fat content as determined by the setting of the cream screw, and will not leave more than 0.015 of fat in the skim milk.

2. Flow of Milk into the Separator Bowl.

The milk inlet supply to all separator bowls is regulated to feed the separator bowl to its full skimming capacity. If the flow of milk is partly shut off the cream line will be narrower, and a richer or higher testing cream will be delivered; an over supply of milk to the bowl will reduce the fat content of the cream and cause an excess of fat in the skim milk.

Regularity of feed is essential and is secured by use of a milk float.

3. The Percentage of Fat in the Milk.

Milk from an average herd will vary in fat content from day to day, and on occasions to quite an appreciable extent. This variation affects the percentage of fat content in the cream obtained by the usual method of separation by centrifugal force.

In milk testing 4 per cent. there are 4 lb. of fat in 100 lb. of milk, in milk testing 3 per cent. there are 3 lb. of fat in 100 lb. of milk.

If a representative sample of each lot of milk is passed through a separator under exactly the same conditions as to temperature of milk, rate of milk supply to the separator bowl, and speed of bowl, there will be practically the same number of pounds of cream, but the cream obtained from the 4 per cent. milk will contain practically 1 lb. of fat more than the practically equivalent amount of cream obtained from 100 lb. of 3 per cent. milk.

4. Temperature of Milk at the time of Separation.

Milk at a temperature of 70 degrees Fahr. is thicker or more viscous than the same milk would be if heated to 95 degrees. The milk at the lower temperature will not run through the separator as fast, the cream line will be narrower, and the cream will test higher than cream obtained from the same lot of milk when it is separated at a temperature of 95 degrees.

With a view of determining the extent of the influence stated conditions have on the percentage of fat in cream experiments have been carried out.

TABLE A.

Effect of variation in the speed of a hand-driven separator bowl on the fat content of the cream and skim milk:—

Per Cent. Fat in Milk.	Temperature Milk.	Turns of Handle per Minute.	Per Cent. Fat in Cream.	Per Cent. Fat in Skim Milk.
3.6	95	50	21.5	.023
3.6	95	55	24.4	.017
3.6	95	60	32.2	.016
3.6	95	65	38.5	.012

With all conditions being similar except the speed of the separator the fat in the cream delivered varied from 21.5 per cent. to 38.5 per centum. Five turns of the handle of the separator per minute below the proper speed made a difference of 6.3 per cent. in the test of the cream.

Turning the separator too slowly causes an increase in the loss of butter fat in the skim milk. Five turns per minute below the proper speed increases the loss of fat .004 per cent.

It is most difficult to turn a separator at a uniform speed throughout the process of separation without the use of a reliable speed indicator, and the irregular speed of the separator is the chief cause of variation in the percentage of fat in cream.

TABLE B.

Showing the effect that varying temperatures of milk at the time of separation have on the fat content of the cream and skim milk:—

Per Cent. Fat in Milk.	Temperature of Milk Separated.	Per Cent. Fat in Cream.	Per Cent. Fat in Skim Milk.
	Degrees, Fahr.		
3.6	70	47.4	.046
3.6	75	43.5	.033
3.6	80	39.5	.028
3.6	85	37.0	.025
3.6	90	35.5	.014
3.6	95	33.0	.012

The effect of varying temperatures of milk at time of separation on the fat content of the cream and skim milk is very evident. It should be noted that the loss of fat in skim milk increases as the temperature of the milk is lowered from that suitable for separation.

TABLE C.

Variation in the percentage of fat in cream from milk containing different percentages of fat and separated under similar conditions:—

Percentage Fat in Milk.	Temperature of Milk.	Percentage Fat in Cream.	Percentage Fat in Skim Milk
3.3	95	28.0	0.014
4.6	95	35.5	0.013

A difference of 1.3 per cent. of fat in milk made a difference of 7.5 per cent. of fat in the cream.

The percentage of fat in the milk from a herd of cows from day to day will not vary as much as 1 per cent.; the variation does not generally exceed 0.5 per cent.

TABLE D.

Adjusting cream screw to regulate the percentage of fat in cream, all conditions pertaining to separation being similar:—

Per Cent. Fat in Milk.	Temperature Separation.	Cream—lb. oz. per 100 lb. Milk.	Per Cent. Fat in Cream.	Lb. Butter Fat in Cream.	Per Cent. Fat in Skim Milk.
		Lb. oz.			
3.5	95	8 0	43.5	3.48	.014
3.5	95	8 5	42.0	3.491	.016
3.5	95	8 8	41.0	3.485	.014
3.5	95	8 11	40.0	3.474	.017
3.5	95	9 14	35.0	3.456	.018

It is noted that when milk is separated under suitable conditions the operator can adjust the cream screw so as to deliver a cream containing the desired percentage of butter fat and maintain efficiency in skimming. As the fat content of the cream is increased the weight of the cream recovered is diminished and vice versa.

All the available butter fat is recovered from the milk if the separator is efficiently operated.

A separator in good running order, properly handled, will deliver cream testing from 20 to 40 per cent. and not leave more than 0.015 per cent. of fat in the skim milk.

The best results are obtained by delivering cream testing not less than 38 per cent. of fat during the period October to March, and not less than 34 per cent. from April to September, being the regulation under "*The Dairy Produce Act of 1920.*"

The butter fat content of the cream should be regulated by adjusting the cream screw.

EDIBLE EARTHS AND SALT LICKS.

The importance of edible earths and salt licks and their use in human and animal nutrition came under consideration during the course of an investigation concerned with the nutrition of animals and the native population in Kenya Colony. In the course of this investigation fifteen samples of edible earth were analysed, and at the same time a number of samples which came to hand from Nigeria were also examined.

In view of the interest of this aspect of nutrition a survey of the literature was made by Dr. Foster. From this it will be seen that a deficiency of some mineral constituent or constituents in the foodstuffs of animals or humans is frequently indicated by pica—i.e., a depraved appetite. This may take various forms, such as earth-eating, bone-eating, or eating of faeces. The natives, apparently in an endeavour to make good deficiencies in locally grown foodstuffs and the natural fodder, themselves consume and feed to their cattle various edible earths and salt licks either occurring in or imported into their districts.

Kenya Edible Earths.—The samples examined showed considerable variation, according to the area from which they were obtained. On the whole the two elements which occur in the highest amount in these substances are sodium and iron. At the same time, they have a much higher percentage of calcium than phosphorus, the reverse of what the foodstuffs show. The majority of the edible earths are heavily loaded up with silica, this forming, on the average, about 56 per cent. of the dry matter. Two of them, however, were fairly free from silica and would make fair substitutes for Magadi soda by virtue of their sodium content.

Nigerian Edible Earths and Native Salts.—Many of the salts from this country are fairly pure salts, either chloride, carbonate, or sulphate of sodium, whilst others are heavily loaded up with silica, soil being presumably the impurity, judged by the relatively high percentage of iron and aluminium oxides. Detailed analyses of the materials from Nigeria, have been published in "*The West African Medical Journal.*" 1929.—W. GODDEN, Rowett Research Institute, Bucksburn, Aberdeen.

CLIMATOLOGICAL TABLE—NOVEMBER, 1930.

SUPPLIED BY THE COMMONWEALTH OF AUSTRALIA METEOROLOGICAL BUREAU, BRISBANE.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	SHADE TEMPERATURE.						RAINFALL.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
<i>Coastal.</i>		In.	Deg.	Deg.	Deg.	Deg.		Points.	
Cooktown	29.98	87	75	94	14	67	24	95	6
Herberton .. ..	.. ..	81	60	92	14	50	23, 24	167	7
Rockhampton	30.03	90	68	99	14	60	4	51	7
Brisbane	30.07	84	65	97	13	59	3	95	8
<i>Darling Downs.</i>									
Dalby	30.06	88	60	98	22	45	15	281	5
Stanthorpe .. ..	.. ..	79	52	89	22	38	15	149	9
Toowoomba .. ..	.. ..	80	58	92	22	45	15	131	4
<i>Mid-interior.</i>									
Georgetown	29.95	97	70	103	14, 15	61	15	139	3
Longreach	29.94	98	69	105	27	59	15, 16	49	2
Mitchell	29.99	90	61	99	22	46	15	310	7
<i>Western.</i>									
Burketown	29.93	93	75	104	14	69	27	476	2
Boulia	29.91	100	72	109	21	64	15, 16, 17	24	3
Thargomindah	29.95	92	67	105	21	57	15	108	6

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING NOVEMBER, 1930 AND 1929, FOR COMPARISON.

Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.		Divisions and Stations.	AVERAGE RAINFALL.		TOTAL RAINFALL.	
	Nov.	No. of Years' Records.	Nov. 1930.	Nov. 1929.		Nov.	No. of Years' Records.	Nov. 1930.	Nov. 1929.
<i>North Coast.</i>					<i>South Coast—continued:</i>				
Atherton	In. 2.15	29	In. 0.74	In. 4.22	Nambour	3.74	34	2.22	2.52
Cairns	3.84	48	1.09	0.87	Nanango	2.58	48	3.48	0.92
Cardwell	4.04	58	1.07	2.58	Rockhampton	2.19	43	0.51	3.15
Cooktown	2.60	54	0.95	1.06	Woodford	3.15	43	2.47	2.30
Herberton	2.56	43	1.67	5.05	<i>Darling Downs.</i>				
Ingham	3.67	38	0.75	2.05	Dalby	2.65	60	2.81	2.15
Innisfail	6.07	49	1.42	3.26	Emu Vale	2.61	34	2.46	1.94
Mossman	4.05	17	3.43	5.04	Jimbour	2.34	42	3.49	1.29
Townsville	1.79	59	0.12	0.25	Miles	2.35	45	4.32	0.73
<i>Central Coast.</i>					Stanthorpe	2.71	57	1.49	2.65
Ayr	1.66	43	0.29	0.20	Toowoomba	3.22	58	1.31	1.99
Bowen	1.29	59	0.20		Warwick	2.58	65	0.90	1.48
Charters Towers	1.48	43	0.06	0.99	<i>Maranoa.</i>				
Mackay	2.94	59	1.12	0.51	Roma	2.05	56	1.88	1.33
Proserpine	2.77	27	1.50	0.31	<i>State Farms, &c.</i>				
St. Lawrence	2.25	59	0.27	0.64	Bungewongoral	1.95	16	1.30	1.41
<i>South Coast.</i>					Gatton College	2.72	31	1.43	1.70
Blagenden	2.74	31	1.76	5.15	Gindie	2.04	31	..	0.60
Bundaberg	2.50	47	0.57	2.38	Hermitage	2.57	24	1.11	1.16
Brisbane	3.68	79	0.95	1.25	Kairi	2.13	16	..	2.41
Caboolture	3.30	43	2.11	1.67	Mackay Sugar Experiment Station	2.61	33	1.22	0.90
Childers	2.68	35	2.25	3.93	Warren	2.85	15	..	1.27
Crohamhurst	4.25	37	2.89	3.44					
Esk	3.18	43	2.13	2.32					
Gayndah	2.82	59	2.11	2.52					
Gympie	3.10	60	4.49	2.49					
Kilkivan	2.53	51	3.57	3.32					
Maryborough	3.08	58	4.61	4.26					

GEORGE. G BOND, Divisional Meteorologist.

THE PECAN NUT.

By H. BARNES, Instructor in Fruit Culture.

THE pecan nut is closely allied to the walnut, in fact it belongs to the same natural order (Juglandaceae). It is one of the hickories, and the generally accepted botanical name is *Hicoria pecan*. It grows wild in various parts of the United States and in the territories around the Gulf of Mexico. This fruit-tree is not as yet cultivated to any extent as an ordinary orchard tree in Queensland, but its possibilities as a profitable tree are well worth considering. It is one of the most important nuts grown in America, and the yield about equals that of the walnut. It is excellent in quality and delicacy.

The pecan tree can be grown in this State over a wide range of localities. It is not altogether foreign, as it is found growing in various parts. Mr. Pentecost, of Toowoomba, has a number of old trees. A few also are found in the Maryborough district. The Acclimatisation Society of Queensland some years ago introduced a number of proved and tested varieties, which have shown promising results in their gardens at Lawnton. This Department also introduced several varieties at one time, but by far the best results to date have been obtained by Mr. E. Collins under the very equitable and natural conditions of Redland Bay.

Mr. F. Petrie, of Petrie, also has a number of fine three to four-year-old worked trees, and, in addition, has upwards of 6,000 young seedlings planted out in nursery rows which will soon be ready for working over with approved varieties, and will be available for distribution.

The tree is also grown in various parts of the Union of South Africa, where it is looked upon as highly profitable.

Propagation.

The propagation of this tree from the seed is not difficult, and is similar to that of the walnut, except that as soon as the nuts are ripe those required for seed should be stratified in beds of slightly moist sand mixed with a little wood-ash: should they become very dry, it is advisable to soak them four or five days in water before placing them in beds to germinate. Dr. Morris, in his book on "Nut Growing," states that better results are obtained if the nuts are not entirely covered by soil, but are partly exposed to the influences of the weather, remembering, of course, that the soil is to be kept moist. A further method of assisting germination which recommends itself is to cover the soil in which the nuts have been planted with bags, which should be dampened occasionally. This will keep the soil moist underneath, and periodical inspection will reveal when the embryo plants are ready to shift. As soon as the nuts start to show life by splitting they are planted out in nursery rows, about 3 to 4 feet apart and a foot apart in the lines. The ground should be well worked, and must be naturally fertile or made so by the addition of manure, well rotted, and worked into the soil. The rows in which the nuts stand are usually sunk to a depth of 2 to 3 inches, and, after setting out the embryo plants, around which the soil must be well pressed, a layer of ash or weak stable manure is spread in the hollowed-out rows.

When the seedling is about a foot above the ground the tap root, which is enormous, will be found to be from $2\frac{1}{2}$ to 3 feet long: during the season, when the tree is dormant, this root may be severed at about $1\frac{1}{2}$ feet below the surface, and the tree allowed to remain in the ground for another year and then planted out in the orchards about 30 feet apart. Grown under favourable conditions the tree obtains enormous dimensions, and specimens in existence in America are 9 feet in diameter and 160 to 170 feet high. Although a few nuts are borne after four or five years of growth, anything like a crop is not expected till the tree reaches the age of from eight to twelve years, when the yield may reach anything from one to three bushels of fruit, increasing, as the tree gets older, up to, say, twenty bushels. The pecan, like the walnut, is very long-lived, and in deep fertile soil will grow and bear for a century or so.

Soil.

It thrives best in deep fertile sandy or clayey loams, bottom lands near river beds and on alluvial deposits. But although it favours this type of country, it has a fairly wide range of adaptability, and many of our old worn-out banana plantations on the sides of hills and mountains could be quite profitably planted up and made to confine their sphere of usefulness instead of being allowed to remain idle. Though partial to fairly moist conditions, the soil must be well drained and the water-content always kept on the move. The tap root has the reputation of seeking water at great depths.

Planting.

In planting out, root development will be very greatly assisted by breaking up the subsoil with the aid of explosives. The use of a $\frac{3}{4}$ -inch or 1-inch plug of gelignite at a depth of 2 feet 6 inches to 3 feet is recommended in the average soil. A hole is made in the ground at the site of the proposed tree with a soil auger when the soil is "dry," or if an auger is not available the hole may be jumped with a bar. The charge, with fuse and cap attached, is then lowered into the hole and the soil filled in, no tamping being required. The shattering effect of an inch plug is 7 feet laterally by 18 inches to 2 feet down. When putting in the trees the best soil should be placed in contact with the roots and well stamped throughout, except a few inches of the uppermost layer. Care must be taken that the trees are not planted too shallow. The nursery mark may even be a little below the general surface of the ground.

Grafting and Budding.

As with most other trees, the product of seedlings, however carefully selected, is variable, so that working-over of proved varieties is resorted to. Great difficulty was at first experienced in obtaining good results, but this difficulty has now been practically overcome, and with a little extra care good results are obtainable. Budwood should be taken from the previous year's growth, and if side if method gives the best results.

Grafting.

Various kinds of grafts are used, one of the most successful and popular being the "rind or bark" graft. The "whip tongue" is also largely used in top-grafting old trees, but the "strap" graft gives better results. Mr. Allsop, of the Acclimatisation Society's gardens at Lawnton, has recently experimented with the "slot" graft, as described by Dr. Morris in his book on "Nut Growing," and has obtained very good results. The one important point is that both buds and scions for grafting are taken from wood of the previous season. A terminal bud—that is, the fruiting bud—should not be used as a scion, as, from the habit of the tree's growth, the bud immediately before the terminal takes up and continues the main vertical growth of the tree and becomes a leader for the time being.

Stocks.

The stocks on which to work selected pecans are varieties of hickories or seedling pecans. The affinity of pecans with many of the hickories is good, and the range of adaptability to various soils may be somewhat greater than that of the pecan seedling itself, although, taking all things into consideration, pecans or pecan seedlings are probably better than those on hickories.

Up to about fifty nuts to the pound is considered a fair-sized sample of pecans, although as few as twenty-five to the pound of some varieties may be selected. The tree is monoecious, as is the walnut, in its flowering habit—that is, the staminate and pistilate blossoms are borne separately upon the same tree. The staminate blossoms appear in clusters of catkins upon the last season's growth, somewhat in advance of the pistilate blossoms, which are found only at the terminals of the new branches.

The tree may be expected to thrive in most of the regions adapted to the culture of ordinary tree fruits of the temperate zones. As a rule, if left to grow at will, it does not stand up well against winds; no doubt pruning to give better scaffolding and greater stability to a certain extent will modify this defect.

Owing to the trees being planted at so great a distance apart, cultures of different sorts are carried on between them during the early period of the orchard's development.

SATISFIED SUBSCRIBERS.

Renewing his subscription to the Journal, a Brigalow farmer writes, 27th November, 1930: "I wish to say it is good for a farmer to get a magazine worth a hundred times the price."

A Proserpine farmer writes, 24th November, 1930: "Please find a renewal of my subscription. I get most farm papers, and of all I reckon the Journal beats the lot."

Answers to Correspondents.

BOTANY.

The following answers have been selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.:—

Milk Weed.

G.A.F. (Clermont).—

Your specimen bore no flowers or seed vessels, but is evidently *Pratia erecta*, commonly known in Queensland as Milk Weed. The specific name *erecta* is rather misleading, as the plant more often than not creeps along the surface of the ground. It is a plant that has been accused on several occasions of poisoning stock, particularly sheep, though stock seem rarely to touch it. It grows in a number of situations in Queensland and develops an underground root system, particularly in cultivated ground, where it becomes a pest and difficult to eradicate.

A Vegetable Fly Killer.

INQUIRER (Brisbane).—

The flowers of *Lomatia silaifolia* have the reputation of killing flies and mosquitoes. The evidence for the destruction of the former seems quite clear, but we are not sure about the latter. Having the reputation of this plant some tests were made some years ago by us and Mr. F. Smith on the flowers of various Proteaceæ, and in *Lomatia* we found that the pollen, but apparently no other part of the plant, possessed a prussic-acid yielding glucoside. Whether this is responsible for the death of insects that visit the flower we will leave the entomologists to say. In spite of the fact that *Lomatia* flowers are poisonous, entomologists have assured us that this plant when in flower is one of their best hosts for a multitude of insects.

Chicory.

(J.W. (Toowoomba).—

The specimen is chicory (*Cichorium Intybus*), which has become quite naturalised and somewhat of a pest on the Darling Downs, particularly about Allora. The plant, as soon as it runs wild, seems to lose its large, carrot-like tap root, for which it is cultivated as an adulterant of coffee. It is a native of Southern Europe.

Carpet Grass.

A.B. (Pomona).—

The specimen is *Paspalum platycaule*, the Broad-leaved Carpet Grass, a tropical American grass naturalised in most warm countries, including Queensland. It is of only secondary value as a fodder, but grows in country where better classes of grass, such as *Paspalum* and *Rhodes*, will not thrive. The Narrow-leaved Carpet Grass, *Axonopus compressus* is, on the whole, a better species. A farmer in your locality who has had great experience with these two grasses is Mr. Walter Tronson, of Ringtail Creek.

Mount Isa Plants Identified.

I. J. MacC. (Mount Isa).—Your specimens have been determined as follows:—

Gossypium Sturtii. This plant is like a Hibiscus, but botanically belongs to the same genus as the Cotton. Unlike the Cotton, however, it has no fibre on the seeds.

Nicotiana suaveolens var. *longiflora*. This plant is usually called Wild Tobacco. It has been accused of poisoning stock in Queensland, and chemical tests have shown it to contain nicotine like the ordinary tobacco of commerce. In parts of Australia the natives have adopted this plant for smoking.

Acacia holosericea. We were very interested to have your remarks about the effect of this plant on children's eyes. The use of the green pods for making a soapy lather for washing hands and removing inkstains, &c., is very common in North Queensland, but we had not before heard of its affecting the eyes. This note is interesting, as the poisonous principle of the Finger Cherry which causes blindness is supposed to be a saponin, a principle similar to that in the green pods of this wattle.

Polycarphae synandra. This plant is somewhat similar to Vanilla Tops (Sowerbaea), but belongs to a very different family.

Plumbago zeylanica, which you call Bride's White, is a different plant from the one in gardens, which is an allied species, *P. capensis*. *Plumbago zeylanica* is a native plant common in Central and North-western Queensland.

Cassia desolata. Yellow flower and crinkled pods.

Tephrosia purpurea. Not *Swainsona galegifolia*.

Erythrina vespertilio. Bat's wing Coral Tree or Cork Tree.

Eryngium rostratum. Native Cryngo.

Heliotropium ovalifolium. White weed on river banks and dry bed.

Ptilotus specatus. Not a *Trichinium*, but the difference is purely botanical.

Ptilotus conicus. Not a *Trichinium*, but the difference is purely botanical.

Evolvulus alsinoides. A densely hairy little plant with small blue convolvulus-like flowers.

Cyperus sp. A sedge with grass-like leaves and greenish-yellow heads.

Heliotropium fasciculatum. Blue flowers and small greyish leaves.

Stemodia viscosa. Your "Violet."

Acacia sp. A wattle with long narrow leaves.

Ocimum sanctum, what you called Aniseed Weed. This plant is fairly common in parts of North Queensland and is sometimes known to bushmen as Wild Marjoram. It is used by them as tea, and is said to be a good tonic with medicinal virtues.

Polycarphae spirostylis. Smaller than *P. synandra*.

Solanum sp. Prickly plant; purple flowers.

Grevillea striata. Beefwood; long, narrow leaves, no flowers.

Acacia humifusa. Thick, round leaves; woolly stems.

Canthium oleifolium. Long leaves; many small yellow flowers.

Cassia venusta. Large leaflets; yellow flowers.

Cassia australis. Small leaflets; yellow flowers.

Capparis sp. With pulpy berries. A species of Bumble Tree or Native Pomegranate.

Goodenia hederacea. Long bell-shaped yellow flower.

Pterocaulon sphacelatum. Small woolly plant with globular flower heads.

Grevillea sp. Large leaves with spines.

Dodonaea viscosa. Hop Bush.

Mr. Hubbard has looked at the few grasses you forwarded and has determined them as follows:—

Red grass (dried up). *Iseilema membranacea*. Flinders Grass.

Kerosene Grass. *Sporobolus australasicus*.

Blue grass without flowers. *Setaria nervosum*.

Grass with dense flowers in short cylindrical head. *Pappophorum Lindleyanum*. White Heads.

Like last, but heads looser. *Pappophorum nigricans*. Also called White Heads.

Blue grass with pitted "flowers." *Andropogon pertusus*. The Bitter or Pitted Blue Grass.

Grass with plump "flowers" loosely scattered and about 4 mm. long. *Eriachne obtusa*.

Spinifex. *Triodia* sp.

The Young Farmer.

HOME PROJECT WORK.

A prize-winning essay written by Verner Kleinschmidt, Woongoolba State School, Queensland.

School club work has several objects. The main one is to introduce a better breed of cattle, pigs, and poultry. Although Australia holds the world's record for the highest production of butter by Melba (Melba XV. of Darbajara) for one year, the yield per year per cow is not as high as it should be. To bring up the average yield per cow higher, calf clubs have been organised all over Queensland and other States. This low yield per cow per year is due to the immense number of "scrubbers" in different dairymen's herds. Thanks to club work, these abominable "scrubbers" are gradually being thinned year by year. The way in which this is accomplished is a very good one.

Pure-bred bulls are presented by leading cattle breeders (if they so desire—on Club Day. They are in the district and thus the few good cattle in the neighbourhood are increased by about 10 per cent. each year. Club days help club work considerably. When a boy's parents see what has been done in connection with club work, they want him to join a club also. When pig clubs are concerned, the main thing is to procure an unsurpassable bacon pig.

In poultry clubs, a superior egg-producer should be aimed at. The extermination of the "barndoor" fowls is a splendid thing and should be continued. "Barndoor" fowls are more or less descendants of mixed breeds of fowls. Club work teaches members not to permit the mixture of their varieties of fowls, but to separate them.

The second object is that of education. It teaches members to be clean where sties, poultry houses, and calf pens are concerned. When the club organiser visits the homes of the club members, they lose points if their fowlhouses and runs are in a state of neglect. A person is filled with chagrin when he knows that he has lost a much-desired prize just through carelessness. When they find this out they clean their houses and runs thoroughly and prepare for the next club day. It is commonly said by ignorant people that pigs love dirt. This is not true. A pig only lies in dirty water on a hot day when it has no cool spot in which to rest. Pig club members learn this.

When application has been made for literature about club work it is sent, and the head teacher distributes it among the members. In these little booklets is valuable information concerning the feeding, rearing, and prevention and cures of diseases of pullets, calves, and pigs. In this way the club member is fitted for his future occupation if it is to be a farmer. Not only does the club member benefit, but his parents benefit also. They, too, learn how to treat diseases in their stock, and how to feed and rear them.

Clubs are educational in other ways. When Club Day has passed and the winner is enabled to attend the Farm Boy's Camp he meets and mixes with other boys from Queensland and New South Wales. He learns all about the industries that are carried on in other parts of Queensland and neighbouring States.

After the boy has returned he lectures to his school mates and they in turn learn what he has learnt. This new information is of considerable value to them in their ordinary school work, as well as on the farm.

Clubs help Australia to produce more, and more production means more wealth.

In the years to come Australia will appreciate fully the splendid work that school clubs have performed.

BERAT STATE SCHOOL CLUB DAY.

Jack Powell gives the following account of Club Day at his school:—

Building farmers, all scholars of the Berat State School, exhibited the stock reared by them on Thursday, 20th November, which had been set aside as Club Day, when officials of the Departments of Public Instruction and Agriculture and Stock judged the pigs and calves; on the previous day the sties and pens in which their stock were housed were inspected. The judges had a busy time inspecting and lecturing, but the enthusiasm of club members and the interest displayed by many grown-up farmers and parents more than repaid their efforts.

Mr. Aitchison (Organiser of Home Projects) and Mr. Shelton (Senior Instructor in Pig Raising to the Department of Agriculture and Stock) had previously visited the homes of club members where inspections were made of pens and sties.

The visitors were favourably impressed with the work done by members of the club and the quality and number of the exhibits. Twelve pigs and twelve calves were exhibited. Mr. Moriarity, a dairy inspector, judged the calves for type and quality, and had much difficulty in making the awards, owing to the evenness of some of the exhibits. Both the judge and Mr. Shelton stated that many of the exhibits would do credit to a country show, and congratulated the members on their work.

A young judges' competition was also decided. The youthful adjudicators were very keen on all points, one giving the same valuation of an animal as the official judge. Mr. P. H. Imhoff, at the request of the chairman (Mr. J. J. Willett), addressed the gathering, which numbered eighty, and stressed the necessity for clubs and the lessons received as a result of project work. Mr. Aitchison gave a résumé of the work throughout Queensland, and stated that the Berat Club compared more than favourably with other clubs visited in the course of the year. Mr. Moriarity and Mr. Shelton also addressed the gathering on various phases of dairying and pig raising. Other speakers congratulated the teacher (Mr. A. W. Mackenzie) and club members upon the success of Club Day. Mr. Mackenzie briefly responded, and thanked those who had assisted. Mr. Houston conveyed the officials from Allora on their tour of inspection. Tea was provided by a committee of ladies.

Awards.

The results of the competition were:—

Senior Pig Club.—L. Hoey, 1; T. Hoey, 2; J. Powell, 3.

Junior Pig Club.—C. Houston, 1; R. Hoey, 2; D. Mackenzie, 3.

Senior Calf Club.—H. Gwynne, 1; L. Hoey, 2; T. Hoey, 3.

Junior Calf Club.—D. Mackenzie, 1; R. Hoey, 2; R. Gwynne, 3.

Junior Judging.—N. Hoey, 1; L. Hoey, 2; H. Gwynne, 3.

The first prize for the senior pig club was a stud berkshire boar donated by the Department of Public Instruction, and that of senior calf club a gold medal presented by Mr. F. W. Kajewskie (Glencoe). D. Gwynne secured the Ham and Bacon Curers Association's medal presented for the best type of bacon pig. The judge remarked that the animal would be difficult to beat. The blue ribbon for the best type of dairy animal was secured by H. Gwynne with a fine A.M.S. heifer. Second and third places were secured by Mr. Rickert and L. Hoey respectively with jersey heifers.

An interesting exhibit was a stud berkshire board, the property of Mr. Joseph Byrne. This attracted general attention, and won much admiration.

POINTS IN PIGGERY MANAGEMENT.

Exercise is important to all young animals, but to none more than young pigs, which are naturally the most active of all the young animals on the farm. When little pigs are turned out with their dam in a meadow they will be racing round half their time, and in the course of a day must cover a distance of several miles. Deprived of this opportunity of healthy exercise, small pigs can never thrive as they should. Pigs which are confined to a small and probably dirty sty will not only grow more slowly, though eating just as much food, but will be liable to cramp and many other ailments which, under better conditions, would never have come their way. It is not only the value of the exercise itself that counts, but the fact that, being in the open and finding plenty of amusement, the pigs are prevented from getting into mischief of a kind that will do them harm. Pigs shut up in a sty with nothing to do will spend their time nosing about in filth and licking dirty troughs and palings, attached to which are the embryos of worms and other parasites. Half the troubles of pigs are to be traced to the presence of worms, and it is in the small and dirty sty that these troubles begin. Little pigs, of course, should never be confined in small and dirty sties, and from the time when they first begin to get steady on their legs—say, at about three weeks old—they are all the better for being given their liberty. That is not to say that whatever the weather they should be turned outside, or that they should be permitted to run about in a dirty yard. Some discretion must be used in these matters, but when no dry meadow is available, or the weather is bad, the opportunity for exercise in a well-sheltered and clean yard should be provided.

General Notes.

Trans-Border Stock Passings.

As the cattle tick is existent in New South Wales, it is necessary to take every precaution with regard to the admission of stock into this State at the Killarney crossing. It was thought that a more efficient inspection, involving less expense, could be effected by stock inspectors if certain days were set aside for this purpose. Consequently an Order in Council, permitting the introduction of stock at the Killarney gate on each alternate Tuesday—that is, the first and third Tuesday in every month—has been made, which will make better provision for the inspections.

The Dairy Produce Act—Recission of Regulations.

Regulations Nos. 142, 143, 146, and 149 made under "*The Dairy Produce Act of 1920*" have been rescinded and new regulations substituted therefor. These deal with the method of payment for milk and cream received at factories, and prescribe the form in which records shall be kept.

The object of these regulations is to ensure that all butter factories will keep proper books and accounts, and that all such books will be kept in a uniform manner throughout the State.

Staff Changes and Appointments.

Constable W. J. Daybell has been appointed also an Honorary Slaughtering Inspector at Rolleston as from the 29th November, 1930.

The appointment of H. A. McDonald, Inspector of Stock, Department of Agriculture and Stock, has been confirmed as from the 13th May, 1930.

The Officer in Charge of Police, Boonah, has been appointed also an Acting Inspector of Stock as from the 29th November, 1930.

Mr. R. J. T. Kidd, Inspector of Stock, has been transferred from Normanton to Burketown as from the 11th November, 1930.

Messrs. W. Dixon, J. T. Smallhorn, G. R. I. Anderson, A. Dick, and B. Dunbevan, Inspectors of Stock and Slaughter-houses, Department of Agriculture and Stock, have been appointed also Inspectors of Dairies as from the 11th December, 1930.

Solving the New Year Gift Problem.

Each year Pike Brothers go to no end of trouble to secure a range of novel and exclusive articles that will be suitable for New Year gifts. In fact, this firm, which has justly earned the reputation of being the largest house in the Commonwealth devoted to man and his needs, is also widely known for the excellent variety of useful presents that it specially stocks each year. A feature that appeals is the numerous articles that men may give to ladies. In this connection, a lady is employed on the staff, because of her special knowledge, and she interprets the orders of mere man in a manner that invariably pleases the womenfolk. This section includes items such as dainty boxes of handkerchiefs, charming sets of lingerie, hose, handbags, watches, cut glass, &c. One happy idea, originated by the firm several seasons ago and now exceedingly popular, is the New Year cheque. This idea is really a merchandise order, which is a novel way of solving the gift problem. You simply fill in the cheque with the amount you desire to give, and, of course, the name of the recipient. They then choose their own presents. Write to Pike Brothers in Queen street, Brisbane, and they will be pleased to forward you full particulars. This idea avoids any possible duplication of presents, and gives added pleasure.

Cotton Board.

An Order in Council has been approved giving notice of the intention of the Governor in Council to extend the operations of the Cotton Board for a further period of five years, that is, until the 31st December, 1936. It is also declared that the Governor in Council will receive, on or before the 5th January, 1931, a petition signed by not less than 10 per cent. of the growers of cotton requesting that a vote of such growers be taken on the question as to whether the functions of the Cotton Board shall cease on the 31st December, 1931, or continue until the 31st December, 1936.

Seasonal Greetings.

A.C.F. and Shirley's Fertilizers, Limited, Brisbane, convey kind thoughts and good wishes for a prosperous New Year to our readers.

From Pastoral Supplies Limited we have received a very fine calendar for 1931, the product of the Country Press Printery, embellished with another series of the dog pictures which this Firm brings out every year.

Grass Seeds in Fat Lambs.

Grass seed is causing a good deal of trouble this season (writes the Sheep and Wool Expert of the Department of Agriculture), and if fat lambs cannot be kept out of the grass seed areas they will stop growing and very quickly fall away. When lambs become affected with seed and their bloom is lost the best plan is to shear them immediately. The seed will not have such a damaging effect on shorn lambs, and they will be marketable again in between one and two months' time if feed is available.

After shearing, if the seed is still annoying them, a dipping in clean water will help to remove the seed which is penetrating the skin.

Wool and Skin Values.

The Queensland Pastoral Supplies, Limited, as most of our readers are aware, is a well-established and soundly financial institution trading exclusively and directly with the man on the land. The progressiveness of this company is already widely known throughout Queensland, and with its customary enterprising spirit it has recently established a new department for the handling of wool, sheep skins, hides, calfskins, marsupial skins, &c., either by directly purchasing these commodities or by the expert preparation of them for market on growers' behalf. Although the purchasing of wool, sheepskins, and hides is a new venture for the firm, this additional department is controlled and staffed by experts with lifelong experience in this trade.

Back to the Land.

Some time ago the Director of the Queensland Bureau of Economics (Mr. J. B. Bridgen) threw out a suggestion by asking the question, "Could we not put our unemployed on some land and let them earn their own living until they get their jobs back again?" Subsequently to that deliverance of Mr. Bridgen's the Premier of Victoria (Mr. Hogan) announced that his Government was considering a proposal to settle large numbers of unemployed on small farms, upon which they can at least grow sufficient food for their own requirements.

In a sub-leader of the "Courier," in which the foregoing facts are adverted to, the writer affirms that within a radius of 12 miles from the Brisbane General Post Office there are fully 100 allotments on which is being put into practice the principles of intensive cultivation on small holdings. Now, it is evident that if the unemployed can be helped to get a livelihood in this way several very desirable objects will be attained.

Inspired by the above mentioned considerations, another writer emphasises the fact that in this State of Queensland there is land enough and lying idle that could produce more than enough fruit, vegetables, milk, cream, butter, bacon, and eggs than would generously feed all unemployed in Australia. With this capacity in a country whose debts to assets, we are told, are as millions to billions, there should be no such thing as people in want. But, of course, transplanting penniless numbers from cities in the South to farms in the North would require considerable capital and organising ability. Still, with such undoubted potentialities, to make no effort at such a time to put some of the idle men on the idle land would be unpardonable. If people with practical knowledge of land settlement gave the subject their attention, no doubt many small schemes would be conceived, some of which would be capable of successful application.

Here is one for consideration. Many who are now being thrown out of work will have some savings, or negotiable assets. If no new outlet offers, these will soon be dissipated. This class, with its evidence of capacity and thrift, would be able to appreciate a business proposition. The cities have been pushed ahead so extravagantly the last few years that they are now overgrown, and must await the further development of the country to bring this surplus growth into profitable use.

Here, then, is a possible remedy. The fertile lands of the country contiguous to the cities and larger centres of population might be made available to all willing to cultivate a small area, if only to provide temporarily for their individual wants and the wants of those dependent upon them.

Animals and Birds Sanctuary.

Lady Musgrave Island, which is situated in the Bunker Group, about 30 miles easterly from Bustard Head, via Gladstone, has been proclaimed a sanctuary under the Animals and Birds Acts, in which it shall be unlawful for any person to take or kill any animal or bird.

The Bot Fly.

Mr. E. H. C. Clayton, M.L.A., writes as follows:—

"It has come to my knowledge that the bot fly has made its appearance in our district. I have taken the opportunity of discussing the matter with Major A. H. Cory, M.R.C.V.S., Chief Inspector of Stock, and I now enclose statement that I have received from him regarding the prevention of the spread of these flies, also the treatment recommended in exterminating them."

COMBATING THE PEST.

Mr. Cory advises:—

"To prevent the flies from finding a suitable lodgment for their eggs, the long hairs should be clipped off or singed from the nose, lips, jaws, shoulders, and legs of all horses. Regular daily grooming should be carried out to detach any fly eggs before they have time to hatch, and the parts from which the long hairs have been removed should be smeared daily with a mixture of linseed oil 20 parts, turpentine or kerosene 1 part. All manure containing bots or grubs should be destroyed by burning. After a horse is affected—viz., when the bot fly grubs are in the stomach—medicines are of little service in removing them until the summer months, when they are being naturally expelled. It is then advisable to drench with one of the following drenches:—

(1) Turpentine 2 oz., mixed in 1 pint of milk; or,

(2) Carbolic acid 2 drachms, glycerine 2 oz., water 4 oz., milk 1 pint.

"Either of these drenches should be followed in a few hours by giving 5 drachms of aloes as a ball, or 1 pint of raw linseed oil."—"South Burnett Times."

NOTICE TO STOCKOWNERS.

AMENDED RATES OF STOCK ASSESSMENT FOR 1931.

Attention is hereby directed to owners of stock when lodging stock returns for 1931, that "The Diseases in Stock Acts of 1915," has been amended to provide for an increased rate of assessment in accordance with the Schedule as shown below.

NEW SCHEDULE RATES OF ASSESSMENT:—

"Diseases in Stock Acts of 1915 to 1930."

3s. for any number from 25 to 99, Horses and Cattle together,
1s. per 100 on actual number of Horses and Cattle together, and
9d. per 100 or part of 100 sheep.

"The Brands Act of 1915."

1s. 6d. per 100 on actual number of Horses and Cattle together.

EXEMPTIONS.

Note.—Under "The Diseases in Stock Acts, 1915 to 1930," owners of less than 25 Horses and Cattle combined are exempt, and owners of less than 100 sheep are exempt. Under "The Brands Act of 1915" owners of less than 50 Horses and Cattle combined are exempt.

IMPORTANT NOTE.

Every stockowner must pay assessment for 1931 at the amended rates and not the rates shown on the back of the Stock Return Forms already distributed.

Appreciation.

The technical branches of the Department of Agriculture and Stock are always eager to place their resources at the disposal of the producer, and appreciation of this practical service is manifested in many ways, of which the following extract from correspondence is typical:—"We thank you whole-heartedly for the prompt and valuable assistance which you gave us. . . and assure you that your assistance was appreciated to the utmost."

BUYERS OF FERTILISERS.

Farmers and other buyers would be well advised never to accept delivery of any material unless it has affixed to every package a plainly printed label setting out the percentages of Nitrogen, Phosphoric Acid, and Potash, and the forms in which they respectively occur.

The buyer should also receive an invoice certificate setting out the particulars that should appear on the labels. Such certificate is the seller's guarantee as to the quality of the material.

In the absence of such label and invoice certificate, it is obvious that the buyer should at once communicate with the Department of Agriculture, William Street, Brisbane.

Buyers are urged to examine all goods on the day of delivery, and when in doubt regarding any fertilisers, seeds, stock foods, or pest destroyers, to write at once to the Department of Agriculture, Brisbane, in order that the matter may be at once investigated.

Australian Instruments Increasingly Popular.

To-day, when the problem of coping with unemployment is receiving such serious consideration from all sections of the community, when everyone is unanimous in their appreciation of the necessity to support Australian industry, it is interesting to note that pianos and player pianos that compare more than favourably with imported instruments in quality of tone and in general excellence, are now being produced within the Commonwealth. These instruments already enjoy well merited popularity. Victor pianos have proved their reliability and remarkable lasting qualities. They have shown themselves to be unaffected by changes of climate, giving equally satisfactory service to owners in all parts of Australia. It is also worthy of mention that the most recent purchase by the New South Wales Conservatorium, probably the most critical musical institution in Australia, was four Victor pianos. Many leading pianists have used Victor pianos for concert work, and speak in glowing terms of their beautiful tonal qualities. These instruments, it may be mentioned, are similar to those offered by Palings on very easy terms. The Brisbane price is £138. Another piano now being manufactured in Palings' Australian factory is the Belling. This, Palings state, is an instrument of exceptionally sweet tone, being particularly suited for the student. It is very solidly constructed, and with ordinary care will give a lifetime of service. This instrument sells at £110 f.o.b. Brisbane. In the player piano field Australia is worthily represented by the Victor "Expression" player piano and the Maxim player piano. Both these instruments are noted for the unusual strength of their construction and their reliability under Australian climatic conditions. Worthy of special note also is the fact that Victor player pianos are "Natural Expression" player pianos—the only instruments of this description in the low-price field. This means that, when used in conjunction with Palings' "Expression" player rolls, the most difficult pieces may be played with perfect expression, tempo, and modulation. The Victor player piano will also play ordinary player rolls. The Victor "Expression" player piano sells at £212 f.o.b. Brisbane. The Maxim player piano, of which the price (f.o.b. Brisbane) is £177, is considered by many competent judges to be quite equal in every respect to many imported instruments selling at much higher prices. It is equipped with a high-grade player action as well as the latest positive style transposer. It is well to remember that Palings arrange very easy terms on all instruments, and every instrument they sell is completely covered by their well-known guarantee. Messrs. W. H. Paling and Co., Ltd., will be pleased to forward free illustrated catalogues to all who are interested in these fine Australian pianos and player pianos.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staff of the Queensland Baby Clinics, dealing with the welfare and care of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

THE HOT WEATHER BOGEY.

Baby enjoys the hot weather. There is nothing that pleases him better than to exercise his limbs freely in the most scanty attire, or in nothing at all, unless it is to splash about in a tub of tepid water. He is released from the burden of clothing, which oppressed him in the cold season, and cramped his movements.

Hot weather is healthy. The three coolest States of Australia have the highest infantile mortality. Last year Queensland had the lowest. That hot weather is dangerous to infant life is just a silly bogey.

Of course, special care is needed during the hot season in some respects. If you overclothe the baby he will suffer from prickly heat. This is caused by excessive sweating when the sweat is not allowed to evaporate freely. Dress him in cool singlets—not in heavy woollens. Outside the singlet he should wear only the coolest of airy garments, and these should be taken off when he is indoors. Do not torment him with flannel binders. Prickly heat is worst on his back, because he lies on that, and the perspiration cannot dry off quickly. Let him lie on cool sheets, or, better still, on cool vegetable mats. Turn him over sometimes, when he is asleep, and train him to lie on his side.

He does not now need so much heat-forming food. Give him rather less solid food, rather less sugar and fat (clinic emulsion for instance). But he needs more fluid, so let him drink as much boiled water as he likes between his meals. Do not forget that this is necessary for babies who are on the breast.

Boil Baby's Milk.

During warm weather all kinds of bacteria grow very rapidly, and so food does not keep, but undergoes changes, which make it unwholesome, and sometimes even dangerous. Especially is this true of milk. You know how quickly it goes sour. Unfortunately, it changes in other ways which are more harmful than sourness. Therefore, be careful to boil your milk as soon as you get it; then keep it in a cool place carefully protected from flies. Pasteurised milk delivered in bottles does not need to be boiled. It will keep good for twenty-four hours on ice; but otherwise, if you have only one delivery, you will need to boil it within twelve hours if it is to be kept till next morning. Should your milk be stale or dirty before it is boiled, it will cause loose motions. When good, fresh milk cannot be had, you may use dried milk (Glaxo or Lactogen).

Diarrhoea.

Loose motions or diarrhoea is common in warm weather, and needs careful watchfulness. Should your baby suffer from this, you must at once stop giving him milk or any kind of food except very thin barley-water slightly sweetened. Let him drink as much as he wants; he will be thirsty, but not hungry. It may be even necessary to take him off the breast for one or two days. You may also give him one teaspoonful of castor oil to clear out any undigested food. Within twenty-four or forty-eight hours he should be much better, and probably a little hungry. A little breast milk may then be given, or you may then give him whey made with junket tablets, but the whey must first be brought to the boil. If he is over nine months, you may also give him some arrowroot, cornflour, or sago boiled with water without milk, or a finger of bread baked hard and crisp. Do not give him milk foods until his motions become natural, and give the milk at first in very small quantity, increasing it gradually.

By this treatment attacks of simple diarrhoea are usually easily cured. But it is very different with diarrhoea caused by infectious bacteria. Of these the most dangerous is dysentery. We told you last month how to guard against this epidemic, which attacks us every year in the early summer during the fly season—not, be it observed, in the hottest time of the year, when the epidemic usually subsides.

Babies Killed by Ignorance.

We hope that our advice will be carefully observed, and that it will save many lives. The cause of the increased sickness and more frequent deaths among our infants during the summer is not the hot weather; it is the prevalence of dysentery and other bowel infections during this season. This infection occurs so frequently because mothers do not know how the dysentery bacilli get into their babies. Babies have died from want of knowledge.

The Premature Baby.

Most people know that when a baby is premature—that is, born before its time—it needs special care and treatment, but many have little knowledge of the special points which require immediate attention, if the child is to have a reasonable chance of survival.

If even half of the premature babies who are born each year in Queensland could live, there would be a marked lowering of the infantile death rate. Of all the deaths that take place in children under one year, about half occur during the first month of life. A large number of these children are either premature, or feeble, weakly infants, who should receive the same care as those who are premature. Such cases should always be under the care of a doctor.

If a baby is under 5 lb. when born, it is better to treat it as premature, to get satisfactory results. Those under 2½ or 3 lb. in weight rarely survive, though cases are on record where infants of less than 2lb. have lived and developed into healthy children.

In appearance, the premature baby differs from the normal baby in more than size. The little body is very soft and limp; the skin wrinkled and downy, and because it is thinner than usual, it looks redder. All the muscles are weak, and the infant is often too feeble to suck. The cry is feeble and suggestive of the mewling of a young kitten. Often the baby cannot cry at all. Such cases need special care from the moment of birth.

FOUR IMPORTANT POINTS.

There are four points which should receive attention. They are prevention of chilling of the baby (that is most important and must come first); careful feeding, on mothers milk; careful avoidance of risk of infection; and avoidance of all unnecessary handling.

Prevention of Chilling.

Because the baby has come too soon into the world, the power of the body to manufacture and regulate its heat is not yet properly developed, and the temperature can quickly fall to a dangerously low level. A premature baby who is allowed to become thoroughly chilled soon after birth rarely lives. When we know that an infant is to be born prematurely, special preparation should always be made to prevent this chilling. A cot should be prepared and thoroughly warmed for its reception. Baby must not be bathed, nor yet even oiled, but, as soon as it is born, wrapped in warmed cotton wool or soft flannel and placed in the cot. At the end of six or eight hours it can be oiled over with warm olive oil and cotton-wool swabs, taking care to do it as quickly as possible and with as little handling of the child as possible. Very frail babies should be oiled without being removed from their cots, and the cot should be placed in a warm, sheltered place and protected from all draughts by screens while this is being done. In hospitals, special cots are kept for premature babies. These are not always available in private homes, but a very useful and comfortable cot can be quickly improvised. A dress basket does admirably; failing this, the family clothes basket can be used, or a drawer out of a chest of drawers can be made to serve, though this last is not deep enough to be as suitable as the two previously mentioned. To prepare the improvised cot: if the weather is cold, first line it with paper—newspaper does quite well—then throw a blanket over it, covering it completely. Next, in the bottom of the basket and over the blanket, place a pillow to serve as a mattress. A pillow-slip or flannelette napkin serves as a sheet, and a small, folded, soft napkin as a pillow. On this the baby,

wrapped in cotton wool and its soft woollen shawl, is placed with a baby blanket over it. The enveloping blanket is now drawn from each side across the cot, but this is not enough warmth for the premature baby. Hot water bags or bottles will be required. Rubber bags are best, but any bottles can be made to serve. In cold weather three are required, in warm weather two will probably be enough. One bag is placed under the mattress at the foot of the bed, and the others at the sides, not close to baby's body but lying on edge, tucked down between the enveloping blanket and the mattress. For the bottle at the foot of the bed use two-thirds boiling water and one-third cold water; for the side bottles use equal parts cold and boiling water. The bags must be refilled in rotation, one every hour in cold weather, less often in summer. Give baby plenty of fresh air—keep him in a well-ventilated room. In our Queensland climate, the air even in winter is not cold enough to hurt the premature baby, provided his bed is kept properly warm. Guard against over-heating. It is wise to have a dairy thermometer in the bed, and this should register between 85 and 95 deg. Fahr.; never more, or it will do baby harm. Gradually decrease the artificial heat as baby's condition improves. Oil baby every second day, taking the same precautions as for the first oiling. Do not put him in the bath until he weighs 5 lb. As he improves, commence with sponging, at first only hands and face, and gradually increase until he is being fully sponged, and later, bathed.

Careful Feeding.

For our premature baby, mother's milk is practically essential. Few survive without it. If circumstances make it impossible for the mother to feed her own baby, endeavour to get milk from another healthy mother. A relative can sometimes be found who has a baby of her own, and so is able to supply some breast milk. It does not matter at all if the foster-mother's milk baby is six or even more months old. It will not hurt the premature body, but it may sometimes be necessary at first to dilute the milk with equal parts of water. If the foster-mother is a stranger, or there is any doubt about her health, boil the milk before giving it to baby. Nothing but plain, boiled water should be given to the premature baby for the first twenty-four or thirty-six hours. After that it must have food. It is impossible to say exactly how much the child should have or how frequently it should be fed. Some strong premature babies can suck the breast and get all they need. Others are quite unable to suck, and at first almost unable to swallow. Such cases must be fed with a pipette or eye dropper, and the milk must be expressed from the mother's breasts and fed to the child. If baby can take very little, say only one or two teaspoonsful at a time, he must be fed every two hours, with one night interval of three hours. With a feeble baby, it may take twenty minutes or even more to take even this small quantity. Increase the interval between feeds by a quarter of an hour at a time, to three hours, with one longer night interval, as soon as baby can take a large quantity at a feed. Also substitute a small feeding-bottle for the eye dropper as soon as the child shows signs of sucking.

If mother's milk is unprocurable, whey may be tried, at first diluted to half strength, until advice can be obtained from a doctor or welfare nurse. A rough estimate of the amount of food that a premature baby should take is 3 oz. for each pound of body weight. So if baby weighs 3 lb., try to give him 9 oz. of fluid daily. He may take much less at first.

Prevention of Infection.

As a result of being undeveloped and weak, baby is very susceptible to infection. Because he is so tiny, he is generally an object of interest and curiosity to neighbours and friends who come to visit him. In his interest this should not be allowed. Even a common cold in an attendant or visitor can easily lead to a fatal pneumonia in a premature baby. For this reason isolate him as far as possible. Have no unnecessary visitors and as few attendants as can be. If mother or nurse develops a cold, she should tie a piece of gauze over her nose and mouth while attending to the child.

Avoidance of Handling.

Handling is very harmful to the feeble premature baby. Until he shows signs of increasing strength, do not remove him from his cot while feeding or oiling him. Handle as little and as gently as possible while changing him; but change of position is necessary; turn him from one side to the other every four hours. The care of a frail, premature baby entails not only much care and trouble, but a high degree of skill. The successful rearing of such an infant is justly a source of pride to mother or nurse.

Orchard Notes for February.

THE COASTAL DISTRICTS.

February in coastal Queensland is frequently a wet month, and, as the air is often heavy with moisture and very oppressive, plant growth of all kinds is rampant, and orchards and plantations are apt to get somewhat out of hand, as it is not always possible to keep weed growth in check by means of cultivation. At the same time, the excessive growth provides a large quantity of organic matter which, when it rots, tends to keep up the supply of humus in the soil, so that, although the property looks unkempt, the fruit-producing trees and plants are not suffering, and the land is eventually benefited. When the weed growth is excessive and there is a danger of the weeds seeding, it is a good plan to cut down the growth with a fern hook or brush scythe and allow it to remain on the ground and rot, as it will thereby prevent the soil from washing, and when the land is worked by horse power or chipped by hand it will be turned into the soil. This is about the most satisfactory way of dealing with excessive weed growth, especially in banana plantations, many of which are worked entirely by hand.

The main crop of smooth-leaf pineapples will be ready for canning, and great care must be taken to see that the fruit is sent from the plantation to the cannery with the least possible delay and in the best possible condition. The only way in which the canners can build up a reputation for Queensland canned pineapples is for them to turn out nothing but a high-class article. To do this they must have good fruit, fresh, and in the best of condition.

The fruit should be about half-coloured, the flesh yellowish, not white, of good flavour, and the juice high in sugar content. Over-ripe fruit and under-ripe fruit are unfit for canning, as the former has lost its flavour and has become "winey," while the latter is deficient in colour, flavour, and sugar content.

For the 30 or 32 oz. can, fruit of not less than 5 in. in diameter is required, in order that the slices will fit the can; but smaller fruit, that must not be less than 4 in. or, better still, 4½ in. in diameter, and cylindrical, not tapering, can be used for the 20-22 oz. can.

Bananas for shipment to the Southern States should on no account be allowed to become over-ripe before the bunches are cut; at the same time, the individual fruit should be well filled and not partly developed. If the fruit is over-ripe it will not carry well, and is apt to reach its destination in an unsaleable condition.

Citrus orchards require careful attention, as there is frequently a heavy growth of water shoots, especially in trees that have recently been thinned out, and these must be removed. Where there are facilities for cyaniding, this is a good time to carry out the work, as fruit treated now will keep clean and free from scales till it is ready to market. Citrus trees can be planted now where the land has been properly prepared, and it is also a good time to plant most kinds of tropical fruit trees, as they transplant well at this period of the year.

A few late grapes and mangoes will ripen during the month, and, in respect to the latter, it is very important to see that no fly-infested fruit is allowed to lie on the ground but that it is gathered regularly and destroyed. Unless this is done, there is every probability of the early citrus fruits being attacked by flies bred out from the infested mangoes.

Strawberries may be planted towards the end of the month, and, if early ripening fruit is desired, care must be taken to select the first runners from the parent plants, as these will fruit quicker than those formed later. The land for strawberries should be brought into a state of thorough tilth by being well and deeply worked. If available, a good dressing of well-rotted farmyard manure should be given, as well as a complete commercial fertiliser, as strawberries require plenty of food and pay well for extra care and attention.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The marketing of later varieties of peaches and plums and of mid-season varieties of apples and pears, as well as of table grapes, will fully occupy the attention of fruitgrowers in the Granite Belt, and the advice given in these notes for the two previous months with regard to handling, grading, packing, and marketing is again emphasised, as it is very bad policy to go to all the trouble of growing fruit and then, when it is ready to market, not to put it up in a way that will attract buyers.

Extra trouble taken with fruit pays every time. Good fruit, evenly graded and honestly packed, will sell when ungraded and badly packed fruit is a drug on the market. Expenses connected with the marketing of fruit are now so high, owing to the increased cost of cases, freight, and selling charges, that it is folly to attempt to market rubbish.

During the early part of the month it will be necessary to keep a careful watch on the crop of late apples in order to see that they are not attacked by codlin moths. If there is the slightest indication of danger, a further spraying with arsenate of lead will be necessary, as the fruit that has previously escaped injury is usually that which suffers the most.

Fruit fly must also be systematically fought wherever and whenever found, and no infested fruit must be allowed to lie about on the ground.

Grapes will be ready for market, and in the case of this fruit the greatest care in handling and packing is necessary. The fruit should never be packed wet, and, if possible, it is an excellent plan to let the stems wilt for a day at least before packing. This tends to tighten the hold of the individual berries on the stem and thus prevent their falling off.

In the western districts winemaking will be in progress. Here again care is necessary, as the better the condition in which the fruit can be brought to the press the better the prospect of producing a high-class wine.

Where necessary and possible citrus trees should be given a good irrigation, as this will carry on the fruit till maturity, provided it is followed up by systematic cultivation so as to retain a sufficient supply of moisture in the soil.

Farm Notes for February.

Reference was made in last month's Notes to the necessity for early preparation of the soil for winter cereals, and to the adoption of a system of thorough cultivation in order to retain moisture in the subsoil for the use of crops intended to be raised during the season. The importance of the subject, and its bearing in relation to prospective crop yields, is made the excuse for this reiteration.

Special attention should be given to increasing the area under lucerne (broadleaf Hunter River) wherever this valuable crop will grow. Its permanent nature warrants the preparation of a thorough tilth and seed bed, and the cleansing of the land, prior to sowing the seed, of all foreign growths likely to interfere with the establishment and progress of the crop. Late in March or early in April is a seasonable period to make the first sowing providing all things are favourable to a good germination of seed.

Dairymen would be well advised to practise the raising of a continuity of fodder crops to meet the natural periods of grass shortage, and to keep up supplies of succulent fodder to maintain their milch cows in a state of production.

Many summer and autumn growing crops can still be planted for fodder and ensilage purposes. February also marks an important period as far as winter fodder crops are concerned, as the first sowings of both skinless and cape barley may be made at the latter end of the month in cool districts. Quick-growing crops of the former description, suitable for coastal districts and localities where early frosts are not expected, are Soudan grass, Japanese and French millet, white panicum, liberty millet, and similar kinds belonging to the *Setaria* family. Catch crops of Japanese and liberty millet may also be sown early in the month in cooler parts of the State, but the risk of early frosts has to be taken.

Maize and sorghums can still be planted as fodder and ensilage crops in coastal districts. In both coastal and inland areas, where dependence is placed largely on a bulky crop for cutting and feeding to milch cows in May and June, attention should be given to Planters' Friend (so-called Imphee) and to Orange cane. These crops require well-worked and manured land; the practice of broadcasting seed for sowing at this particular season encourages not only a fine stalk but a density of growth which in itself is sufficient to counteract to some extent the effect of frost.

In most agricultural districts where two distinct planting seasons prevail, the present month is an excellent time for putting in potatoes. This crop responds to good treatment, and best results are obtainable on soils which have been previously well prepared. The selection of good "seed" and its treatment against the possible

presence of spores of fungoid diseases is imperative. For this purpose a solution of 1 pint of formalin (40 per cent. strength) to 24 gallons of water should be made up, and the potatoes immersed for one hour immediately prior to planting the tubers. Bags and containers of all kinds should also be treated, as an additional precaution. "Irish Blight" has wrought havoc at times in some districts, and can only be checked by adopting preventive measures and spraying the crops soon after the plants appear above the ground. Full particulars on the preparation of suitable mixtures for this purpose are obtainable on application to the Department of Agriculture, Brisbane.

Weeds of all kinds, which started into life under the recent favourable growing conditions, should be kept in check amongst growing crops; otherwise yields are likely to be seriously discounted. The younger the weeds the easier they are to destroy. Maize and other "hoed" crops will benefit by systematic cultivation. Where they are advanced, and the root system well developed, the cultivation should be as shallow as possible consistent with the work of weed destruction.

First sowings may now be made of swede and other field turnips. Drilling is preferable to broadcasting, so as to admit of horse-hoe cultivation between the drills, and the thinning out of the plants to suitable distances to allow for unrestricted development. Turnips respond to the application of superphosphate; 2 cwt. per acre is a fair average quantity to use when applied direct to the drills.

Where pig-raising is practised, land should be well manured and put into good tilth in anticipation of sowing rape, swedes, mangels, field cabbage, and field peas during March, April, and May.

QUEENSLAND SHOW DATES, 1931.

Stanthorpe: 4th to 6th February.
 Allora: 18th and 19th February.
 Killarney: 27th and 28th February.
 Milmeran: 3rd March.
 Pittsworth: 5th March.
 Warwick: 10th to 13th March.
 Toowoomba: 23rd to 26th March.
 Oakey: 11th April.
 Dalby: 15th and 16th April.
 Chinchilla: 21st and 22nd April.
 Taroom: 4th to 6th May.
 Boonah: 6th and 7th May.
 Murgon: 8th and 9th May.
 Ipswich: 12th to 15th May.
 Mitchell: 13th and 14th May.

Kilkivan: 20th and 21st May.
 Biggenden: 21st and 22nd May.
 Wowan: 4th and 5th June.
 Lowood: 19th and 20th June.
 Mount Lareom: 19th and 20th June.
 Rockhampton: 23rd to 27th June.
 Kilcoy: 2nd and 3rd July.
 Cleveland: 10th and 11th July.
 Rosewood: 17th and 18th July.
 Ithaca: 18th July.
 Royal National: 10th to 15th August.
 Wynnum: 28th and 29th August.
 Imbil: 2nd and 3rd September.
 Beenleigh: 18th and 19th September.
 Rocklea: 26th September.

Readers are reminded that a cross in the prescribed square on the first page of this "Journal" is an indication that their Subscription—one shilling—for the current year is now due. The "Journal" is free to farmers and the shilling is merely to cover the cost of postage for twelve months. If your copy is marked with a cross please renew your registration now. Fill in the order form on another page of this issue and mail it immediately, with postage stamps or postal note for one shilling, to the Under Secretary, Department of Agriculture and Stock, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

Times Computed by D. EGLINTON, F.R.A.S., and A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

MOONRISE.

Date.	January, 1931.		February, 1931.		Jan. 1931.	Feb. 1931.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
1	5.3	6.47	5.26	6.44	p.m. 3.38	p.m. 5.30
2	5.3	6.47	5.27	6.44	4.41	6.28
3	5.4	6.47	5.28	6.43	5.46	7.15
4	5.4	6.48	5.29	6.42	6.49	7.55
5	5.5	6.48	5.30	6.41	7.50	8.32
6	5.6	6.48	5.31	6.40	8.42	9.7
7	5.6	6.49	5.32	6.40	9.24	9.41
8	5.7	6.49	5.33	6.39	10.12	10.16
9	5.8	6.49	5.33	6.38	10.37	10.52
10	5.9	6.49	5.34	6.37	11.9	11.35
11	5.9	6.49	5.34	6.37	11.42	a.m. 12.22
12	5.10	6.49	5.35	6.36	a.m. 12.19	1.15
13	5.11	6.49	5.36	6.35	12.53	2.10
14	5.12	6.48	5.36	6.35	1.37	3.5
15	5.13	6.48	5.37	6.34	2.25	4.1
16	5.14	6.48	5.38	6.34	3.19	4.57
17	5.15	6.48	5.38	6.33	4.15	5.52
18	5.16	6.48	5.39	6.32	5.11	6.45
19	5.17	6.47	5.40	6.32	6.7	7.37
20	5.17	6.47	5.41	6.31	7.5	8.27
21	5.18	6.47	5.42	6.30	7.58	9.18
22	5.19	6.47	5.43	6.29	8.50	10.15
23	5.20	6.47	5.43	6.28	9.42	11.11
24	5.21	6.47	5.44	6.27	p.m. 10.31	12.10
25	5.21	6.46	5.45	6.26	11.26	1.10
26	5.22	6.46	5.46	6.25	p.m. 12.21	2.10
27	5.22	6.46	5.46	6.24	1.20	3.11
28	5.23	6.46	5.47	6.28	2.22	...
29	5.24	6.45	...	...	3.24	...
30	5.24	6.45	...	...	4.28	...
31	5.25	6.45	...	...	...	...

Phases of the Moon, Occultations, &c.

4 Jan. ○ Full Moon 11 15 p.m.
 11 ") Last Quarter 3 9 p.m.
 19 " ● New Moon 4 36 a.m.
 27 " (First Quarter 10 5 a.m.

Perigee, 7th January, at 12.48 a.m.
 Apogee, 22nd January, at 11.18 p.m.

Early in the morning of the 7th the Moon will pass apparently so close to Mars that it will cause an occultation of that planet at places north of Australia. It will afford an interesting sight, especially with optical aid, though the Moon will be rather too bright for the best view of such an occurrence in Queensland.

On the 27th Mars will reach that part of its orbit which will bring it to about 62,000,000 miles distant from the Earth; it will then be on the opposite side of it to the Sun.

Mercury will set at 7.29 p.m. on the 1st and rise at 3.59 a.m. on the 15th.

Venus will rise at 2.24 a.m. on the 1st and at 2.9 a.m. on the 15th.

Mars will rise at 9.15 p.m. on the 1st and at 8.7 p.m. on the 15th.

Jupiter will rise at 7.15 p.m. on the 1st and at 6.11 p.m. on the 15th.

Saturn will rise 38 minutes before the Sun on the 15th. For the earlier part of January the Southern Cross will be below the horizon when the Sun sets, only coming into view about 9 p.m. in the south-south-east with its head very much inclined downwards; at the end of the month this will occur two hours earlier.

3 Feb. ○ Full Moon 10 26 a.m.
 10 ") Last Quarter 2 10 a.m.
 17 " ● New Moon 11 11 p.m.
 26 " (First Quarter 2 42 a.m.

Perigee, 4th February, at 8.24 a.m.
 Apogee, 19th February, at 7.42 a.m.

Although an occultation of the planet Mars by the Moon will occur early in the evening of the 2nd, it will be hardly visible at all in Australia. South of Cooktown the planet will appear outside the disc of the Moon, the distance increasing with southern latitude.

Neptune, which can no longer be called the most distant planet from the Earth and Sun, will be in opposition to the latter on the 23rd. It will then be more than 2,786 million miles from the Earth, while the Sun will be barely 92 million miles distant. The earth, which will be nearly on a line between the Sun and Neptune, will have Neptune rising as the Sun sets. It will be about 5 degrees eastward of Regulus, the principal star of Leo. Only possessors of telescopes will be able to locate Neptune, which merely has the appearance of a small star.

Venus and Saturn will appear to be very near to each other, especially on the 25th. As they will rise about 2 a.m., some 20 degrees south of east, these fine planets will form an interesting spectacle in the early hours of the morning near the end of the month.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]